DOCUMENT RESUME

ED 241 432 SO 015 488

AUTHOR Bouvier, Leon F.
TITLE Planet Earth, 1984-2034: A Demographic Vision.
INSTITUTION Population Reference Bureau, Inc., Washington, D.C.
PUB DATE Feb 84
NOTE 45p.; Photographs and charts printed on colored paper may not reproduce well.
PUB TYPE Information Analyses (070) -- Collected Works - Serials (022)
JOURNAL CIT Population Bulletin; v39 n1 Feb 1984

EDRS PRICE MF01/PC02 Plus Postage.
DESCRIPTORS Birth Rate; Demography; Developed Nations; Developing Nations; Economic Factors; *Futures (of Society); Global Approach; Population Distribution; *Population Growth; *Population Trends; Rural to Urban Migration; Social Science Research; World Affairs; World Problems

ABSTRACT

In recognition of the 1984 World Population Conference, this booklet examines the current state of world population and presents speculations on what it might be 50 years from now. World population, now close to 4.8 billion and growing at 1.8 percent a year, is being shaped by three demographic phenomena: prolonged below-replacement fertility in developed nations; rapid growth despite falling fertility in developing nations, due to earlier rapid mortality decline; and rapid urbanization in developing nations and unprecedented migration from poor to better-off nations. Nondemographic factors related to population change in the next 50 years are predicted to be: no world war, global resource adequacy, rapid scientific and technological progress, demise of capitalism and communism, and greatly increased aid from advanced to less advanced nations. By the year 2034, nations may be divided into service/information societies, where immigration balances low fertility to prevent population decline; industrialized nations with fertility at replacement level; developing nations in sight of replacement-level fertility; and least developed nations with critical demographic problems. Zero population growth is possible in another 50 years, but only if humankind acts to see that the stated nondemographic assumptions are borne out. (Author/LP)

****
* Reproductions supplied by EDRS are the best that can be made *
* from the original document. *
****

U.S. DEPARTMENT OF EDUCATION
NATIONAL INSTITUTE OF EDUCATION
EDUCATIONAL RESOURCES INFORMATION
CENTER (ERIC)

☐ This document has been reproduced as received from the person or organization originating it.

✓ Minor changes have been made to improve reproduction quality.

• Points of view or opinions stated in this document do not necessarily represent official NIE position or policy.

PERMISSION TO REPRODUCE THIS MATERIAL HAS BEEN GRANTED BY

Robert Worrall

TO THE EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)."

ED241432

POPULATION BULLETIN

PLANET EARTH 1984 - 2034:

A DEMOGRPAHIC VISION

BY
Leon F. Bouvier

SO 015 488

Planet Earth 1984-2034: A Demographic Vision

By Leon F. Bouvier

	Page
Introduction	3
Setting the Stage: Some Demographic Precursors	4
Below-replacement fertility in developed countries	4
Continuing growth in developing world	7
International migration mounting	8
Planet Earth's Population: 1984	10
Some Non-Demographic Assumptions	15
Nuclear war and international relations	15
Natural resources and space exploration	16
Science and technology	17
Political and economic structures	18
Population Change: 1984-2034	19
Population in the Year 2034	24
Service information societies	25
Industrialized nations	28
Developing countries	30
Least developed nations	31
A new demographic transition model	31
The Non-Demographic Picture: 2034	32
Toward a New Society?	34
Epilogue	35
References	37
Selected Bibliography	39

Figures

1. Latin American Birth, Death and Natural Increase Rates and Total Population: 1960-2025	9
2. Population Age Pyramids of Developing and Developed Regions: About 1984	12
3. Population Age Pyramid of a Typical Western European Service Information Country in 2034	26

Tables

1. Fertility Rates in Selected Developed Countries: 1970, 1973, 1975, 1982	5
2. World Population: 1884-1984	11
3. World's Ten Largest Urban Agglomerations: 1984	13
4. Ten Youngest and Ten Oldest Countries: About 1984	15
5. World's Ten Largest Urban Agglomerations: 2034	22
6. World's Ten Most Populous Countries in 2034: Author's Estimates	25

POPULATION BULLETIN

Vol. 39, No. 1, February 1984

Planet Earth 1984-2034: A Demographic Vision

By **Leon F. Bouvier**

Population Reference Bureau, Inc.

About this *Population Bulletin* and its author

In this Bulletin, *demographer Leon Bouvier examines the present demographic situation of planet Earth and speculates what it might be 50 years from now. The inspiration for the* Bulletin *was both the arrival in fact of* 1984, *the fictional date of George Orwell's famous futuristic novel, and the designation of 1984 for the International Population Conference planned as a tenth-anniversary followup to the World Population Conference of 1974.*

The Bulletin *differs considerably from the Population Reference Bureau's usual publications. It does not rely primarily on standard demographic techniques and data sources; rather, it reflects the views and vision of one demographer, the author. Thus, the* Bulletin *is not intended as a specifically demographic article and it does not necessarily represent the opinions of the PRB, its officers or its staff.*

Leon Bouvier is Senior Research Associate at the Population Reference Bureau. He has served as staff demographer to two population-related commissions of the U.S. government—the Select Committee on Population and the Select Commission on Immigration and Refugee Policy. He is author of numerous Population Bulletins, *many articles in professional journals, and several books, including (with Robert Weller) the textbook* Population: Demography and Policy *(St. Martin's Press, 1981). He holds the Ph.D. in sociology from Brown University.*

The author appreciates the constructive advice received during his preparation of this Bulletin *from his colleagues at PRB—Cary Davis, Carl Haub, Elaine Murphy, Robert Worrall and, in particular, editor Jean van der Tak. However, the opinions expressed are solely his.*

The author wishes to dedicate this Bulletin *on the future of planet Earth to his eight wonderful grandchildren who will experience the 21st century. Hopefully, should they read this* Bulletin *in 2034, they will not think too unkindly about their "pépère."*

Thirty-five years ago George Orwell gave us *Nineteen Eighty-Four.*[1] As humankind in fact reaches that ominous year, it is appropriate to examine just where we stand on this planet we call Earth. But beyond that, the mystique surrounding the year 1984 also tempts us to use it as a *starting point* from which to look once again into the future. This *Bulletin* is such an attempt.

It is not another "1984 revisited." Instead, in recognition of 1984 as also the tenth anniversary of the World Population Conference in Bucharest and the year of the International Population Conference scheduled for August in Mexico City, this *Bulletin* examines what the size, distribution and composition of the planet's population might be 50 years from now and what that will mean for Earthlings in 2034.

Projecting or predicting the future population size of the world or its countries and regions is not a novel idea, of course. As early as 1751, Benjamin Franklin in his "Observations Concerning the Increase of Mankind" assumed that the population of the American Colonies at that time was about one million. He then predicted: "This one million doubling, suppose, but once in twenty-five years, will, in another century, be more than the people of England, and the greatest number of Englishmen will be on this side of the water."[2] He also expressed concern that "the number of purely white people in the world is proportionately small" but explained that "perhaps I am partial to the complexion of my country, for such kind of partiality is natural to mankind."

The first set of world and regional population projections to be prepared by

Satellite view of Earth. NASA

the United Nations was published in 1952.[3] The Population Reference Bureau's *World Population Data Sheet*, which always includes a column on future population size, has been published annually since 1962. In this *Bulletin* we go beyond straightforward projections to examine how the demographic assumptions selected will reflect social, individual and political behavior around the world and what the results of these assumptions about demographic behavior will mean for the societies and the world of 2034.

All humans on planet Earth are population actors; that is what is meant by demographic behavior. We are born and, in turn, we give birth to others; we move or we do not move; we all die, but at younger or older ages, depending on numerous social as well as biological circumstances. Our decisions to have numerous offspring or none at all, our decisions to move within a country or across international borders, the fact that we can expect to live 50 or 80 years—all are affected by the political, technological, economic, societal and ecological forces that surround us.

Our demographic behavior will in turn determine whether the population of planet Earth—now around 4.8 billion and growing by some 83 million a year—will be up to 10 billion and still growing rapidly in 2034 or be closer to 7 billion and approaching stabilization or zero growth. Our population acts will determine whether 80 or 85 percent of the planet's population will be living in developing countries, as currently defined, and whether cultural heterogeneity will replace cultural homogeneity in some nations. It is thus important that our vision of the future not be limited to simple projections based on a series of alternative demograhic assumptions. While these serve a useful purpose, still more important is to consider *why* these assumptions are selected, that is, how our demographic behavior is affected by other forces and what the results will mean for humankind.

Setting the Stage: Some Demographic Precursors

Below-replacement fertility in developed countries

Sometime around 1973, a momentous new demographic phenomenon began to unfold throughout most of the developed world—fertility fell below the level of 2.1 births per woman needed to replace the population in the long run *and remained there*. Country after country—Canada, East Germany, West Germany, the United Kingdom, the United States—reported fertility rates under two births per woman in 1973 and still lower rates in the early 1980s (see Table 1). Actual population size did not begin to fall immediately in the early 1970s. This is because all of these nations experienced a rise in their fertility rate after World War II; some for just a few years; others, like Australia, Canada and the United States, for ten or 15 years. As a result, the number of young couples in the childbearing ages was relatively substantial in the 1970s so that even with extraordinarily low fertility *per woman*, births continued to outnumber deaths each year, reflecting what is called a population's built-in "momentum for growth." But by the late 1970s, the effect of that momentum had subsided in many European countries and in some, annual deaths began to outnumber annual births. Population decline was noted in Austria and East and West Germany. Continued immigration and the higher fertility of immigrants warded off decline for a while in other countries, but by the early 1980s, France and the United Kingdom were losing population, as well as Hungary in Eastern Europe.

In the more junior developed nations—United States, Canada, Australia, New Zealand—the trend toward actual population decline is slower because of the

Table 1. Fertility Rates in Selected Developed Countries: 1970, 1973, 1975, 1982

Country	Total fertility rate[a]			
	1970	1973	1975	1982
Europe				
Austria	2.32	1.95	1.84	1.70
Belgium	2.24	1.96	1.73	1.60
Denmark	1.95	1.94	1.92	1.43
France	2.47	2.29	1.93	1.94
Germany, East	2.19	1.58	1.51	1.86[b]
Germany, West	2.01	1.54	1.45	1.40
Hungary	1.96	1.95	2.35	1.79
Italy	2.37	2.33	2.19	1.57[b]
Luxembourg	1.97	1.55	1.55	1.58[b]
Netherlands	2.58	1.92	1.66	1.49
Norway	2.51	2.24	1.98	1.71
Spain	2.87	2.81	2.80	1.99[b]
Sweden	1.92	1.87	1.77	1.62
Switzerland	2.09	1.80	1.60	1.55
United Kingdom	2.44	2.02	1.81	1.84[b]
Other areas				
Australia	2.85	2.49	2.15	1.94[b]
Canada	2.33	1.93	1.90	1.70[b]
Japan	2.13	2.14	1.89	1.74[c]
United States	2.48	1.90	1.80	1.89

Sources: Jean-Noel Biraben, "L'Europe: données statistiques," *Population*, July-October 1978, p. 994; Alain Monnier, "L'Europe et les pays developpés d'outre-mer: données statistiques," *Population*, July-October 1983, Table 3, p. 833; and Center for International Research, U.S. Bureau of the Census, personal communication, January 1984.

[a]The *total fertility rate* indicates the average number of lifetime births per woman in a population if all women were to live through their childbearing ages (usually considered ages 15-49) bearing children at the same rates as women of those ages actually did in a given year. [b]1981. [c]1980.

reverberating impact of the tremendous post-World War II "baby boom" generation and because immigration levels remain high. Nevertheless, the U.S. Census Bureau projected in 1982 that the U.S. population would stop growing at about 309 million by 2050 and then begin to decline, given continued below-replacement fertility and if net immigration is limited to 450,000 per year.[4] Espenshade, Bouvier and Arthur have calculated that even with net immigration of 400,000 per year, the U.S. population would be reduced to 108 million before achieving zero growth in some 200 years, if the national fertility rate continues below replacement.[5]

Short-lived periods of such low fertility have occurred in the past. During the Great Depression of the 1930s fertility fell below replacement level in most of Western Europe and in the United States, for example.[6] But the rates began to climb again by the late 1930s in the United States and during World War II in Western Europe. Never before in modern history has fertility been so low in so many countries for such a long period as has been the case since 1973. And as of 1984, the rate in most developed countries shows no evidence of climbing back to the point where population growth, or at least population replacement, can be assured over the long run.

End of growth in developed world

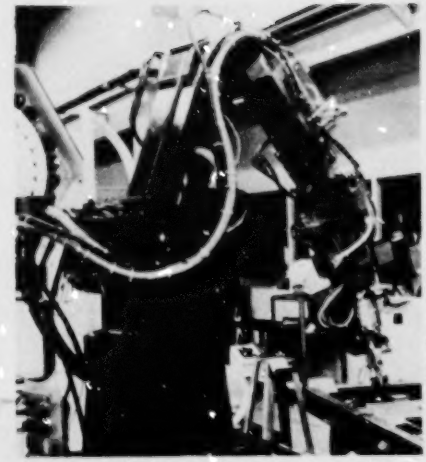
What is the significance of this new demographic pattern throughout most of the developed world? It suggests an adaptation to a new era. The developed nations of planet Earth may well be poised on the brink of an entirely new age when the quantitative demands for labor will be modest, although the qualitative demands will be great.

There have been harbingers of this momentous change. John Naisbitt notes in his 1982 bestseller *Megatrends*: "In 1956 for the first time in American history, white-collar workers and technical-managerial positions outnumbered blue-collar workers. Industrial America was giving way to a new society where for the first time in history most of us worked with information rather than producing goods."[7] Naisbitt named this the "information society." Sociologist Daniel Bell called it the "post-industrial society."[8] Demographer Anthony Richmond went one step further and labeled it the *Verbindungschnetschaft* (roughly, "suburban post-industrial") society as distinct from its predecessors *Gemeinschaft* ("rural-agricultural") and *Gesellschaft* ("urban-industrial") societies.[9] None of these social observers, however, have identified an end to population growth as an important ingredient in this emerging new society.

We are at the onset of a social upheaval as great as that touched off by the Industrial Revolution which began some 200 years ago in Western Europe and then spread to its colonies. Interestingly, a demographic revolution occurred then also. With the improved living conditions resulting from the Industrial Revolution, mortality began to fall gradually from the end of the 18th century. Couples took a while to adjust to the fact that more of their children were surviving and fertility generally did not begin to fall until late in the 19th century. During this interim period, population growth rose to over 1 percent a year in many Western European countries, rates which were unprecedented in world history to that time. This growth helped supply workers needed for the cities' burgeoning industries and immigrants for the "New World." Then Western European couples came to realize that they could take advantage of improving social and economic opportunities by having fewer, but better educated children. Today's population actors—at least those in developed nations—are once again responding appropriately to meet the needs of a new era.

This "information society," as Naisbitt calls it, benefiting from high technology and, by 1990, from robotic technology, will be knowledge-intensive rather than labor-intensive. The pattern of shifting the production of shoes or textiles, for example, to lower-wage developing countries is now being followed with the sophisticated "tools" of the information age. The 1983 decision by California-based Atari to move assembly-line work for its microcomputers to Hong Kong and Taiwan is but an early example of what is likely to become standard procedure. Even many service occupations may be eliminated in developed countries. Economist Wassily Leontief recently suggested that "the ability of the service sector to absorb displaced workers will diminish." He added: "As soon as not only the physical but also the controlling 'mental' functions involved in the production of goods and services can be performed without the participation of human labor, labor's role as an indispensable 'factor of production' will progressively diminish."[10]

Paralleling the technological evolution of their societies, developed nations are attaining demographic maturity. To borrow somewhat warily from the "organismic" sociologists of the 19th century, organismic demography would visualize societies following the same aging cycles as individuals. Societies are born (following a very long pregnancy) and rapid population growth immediately occurs. This is followed by an adolescent period



Thomas J. O'Halloran—USN&WR

Robots will displace much human labor in the new information age.

when growth is still taking place, but at a much slower pace. The United States is just emerging from adolescence at this time. Adulthood arrives, as it did in Western European countries in the late 1960s, and with total maturity no further growth is to be observed. (Occasional late spurts could be called "middle-age spread," but this would be carrying the organismic analogy too far!)

Some nations in the developed world are younger than others but all are now adults. Some have reached old age and face population decline. A few could eventually "disappear" as distinctive societies in the sense that ancient Greece and the Roman empire disappeared.

Continuing growth in developing world

But what of the developing world—the other 75 percent of planet Earth's current population? In some of these regions major demographic changes have also taken place. Soon after the end of World War II mortality began to fall precipitously in Latin America and in Asia, though not in Africa. The mortality decline that had taken up to a century in Western Europe occurred in about 15 years from the late 1940s to the early 1960s. Meanwhile, fertility remained high—much higher than it ever was in Western Europe where national birth rates were reduced during the 18th and 19th centuries because many women married late or not at all. The results in the developing world were rates of "natural increase" (birth rates minus death rates) of 3 percent and upward a year—two or three times what they ever were in Western Europe. Public concern over this "population explosion" began in the 1950s and rose to a pitch in the late 1960s with the publication of biologist Paul Ehrlich's *The Population Bomb*.[11] The 1970s gave rise to the controversy between those advocating development assistance and those favoring family planning assistance, but both camps were bent on solving the problem of rapid population growth in developing countries. Yet rapid growth continues to this day and will for some time to come, despite remarkable progress in reducing fertility in some of these countries. Why is this? How can population be increasing so rapidly while the average fertility per couple is falling?

In those countries that benefited most from mortality decline in the 1950s and 1960s, a "death dearth" occurred while fertility remained high. Infants and children who a generation earlier would have been likely to die remained alive to become the young adults of the 1970s and 1980s. These young adults constitute a giant generation in the childbearing ages—much larger even than that of the United States and Canada today which resulted not from mortality decline but from the fertility rise, or baby boom, of about 1947 to 1964. Even though these couples in many developing countries are averaging fewer children than their parents did, there are so many of them that the total numbers of births continue to increase each year and will for several decades, despite falling fertility rates. For developing countries the effect of this built-in momentum for population growth is larger and will last longer than the comparable "baby boom" effect in the

United States because previous fertility was so much higher and their mortality decline so precipitate. In Mexico, for example, women still averaged 6 to 7 births apiece in the late 1950s compared to the U.S. baby boom peak of just over 3.5 births per woman at about the same time. Currently the Mexican fertility rate is down to about 4.7 births per woman and the United Nations projects that it will be down to about 2.3 births per woman by 2025. Yet, the United Nations also projects that because of continuing large proportions of young people in the childbearing ages, annual numbers of births in Mexico will actually increase from about 2.7 million in the early 1980s to around 3.2 million births in 2025. That, coupled with further decline in the death rate, could mean that Mexico's population will balloon in a mere 45 years from 70 million in 1980 to 174 million in 2025.[12]

Figure 1 shows estimates and projections from the Centro LatinoAmericano de Demografia (CELADE) which sum up the picture for Latin America as a whole. The regional birth rate per 1,000 population has fallen rapidly since 1960 and will continue to fall much faster than the death rate to 2025 so that the *rate* of natural increase falls. But population *numbers* continue to grow dramatically and will still be mounting well into the 21st century.

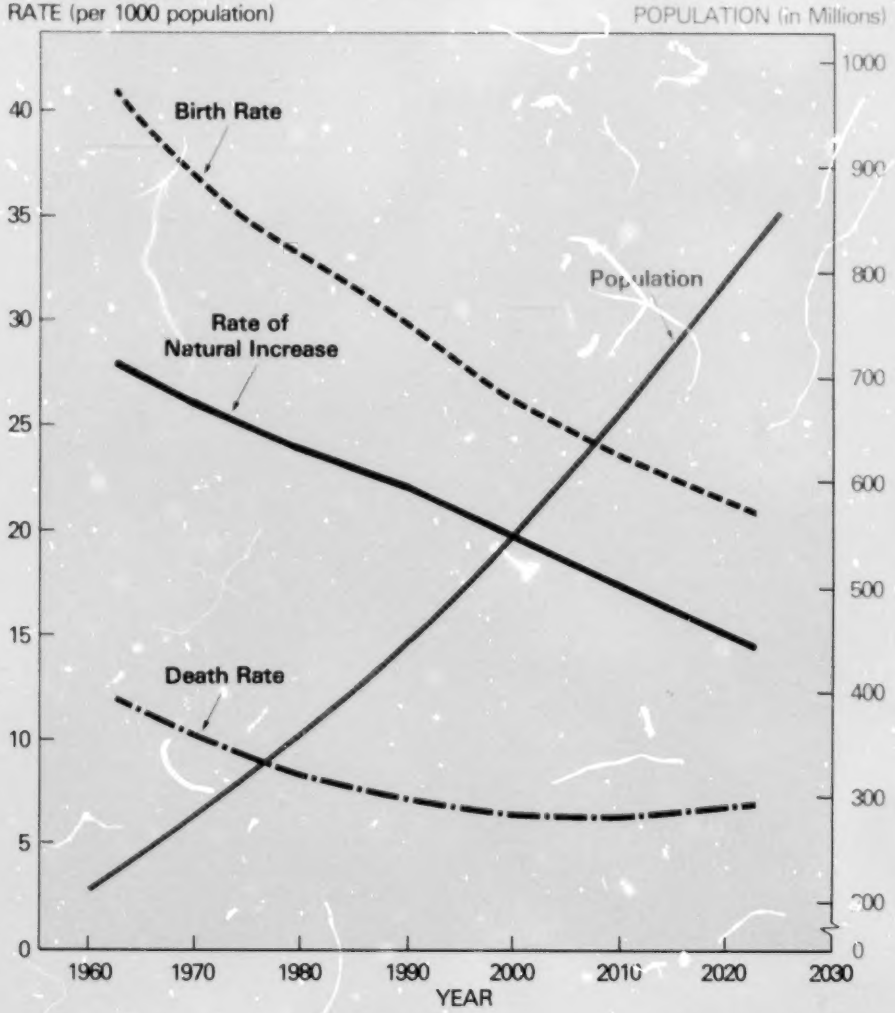
Thus, this demographic change—the mortality decline—while justly heralded as the beginning of a better life for developing countries, also contributed to high growth rates in many countries where fertility is now falling. Unprecedented numbers of young adults have survived to have themselves what in the aggregate are even larger numbers of children, despite the drop in the average number of children per couple. This is compounding the problems of providing adequate care and education for dependent children and jobs and housing for the parent generation.

From this one should not conclude that mortality reduction should not be encouraged. On the contrary, every human being has the right to as long and healthy a life as possible. Furthermore, as life expectancy increases as a result of declining death rates, the contribution of mortality decline to population growth is reduced. When life expectancy at birth is as low as, say, 35 years, 35 to 40 percent of deaths in a population occur to children aged five and under, while 25 to 30 percent occur to those aged 60 and over. At a life expectancy of 75 years (as in some developed countries today), only 5 to 20 percent of deaths occur to small children, and 70 to 80 percent occur to those aged 60 and over. Demographers Davidson Gwatkin and Sarah Brandel point out the significance of this shift for population growth.[13] "Older people very rarely have children. Hence delaying the death of a 60-year-old adds only one person to the population. In contrast, when an infant is saved from death, the person saved is only the beginning. In later years that person's children, grandchildren and further descendants are added to the population in geometrically increasing numbers." This effect wanes as life expectancy increases. By the time life expectancy reaches 55 years (three years less than the overall average for less developed countries today) fewer young people are dying, so that another gain of five years in life expectancy "would yield an increase in the population only slightly more than half as large as a gain of five years from a life expectancy of 35 years."

International migration mounting

The current and future population picture of planet Earth is being increasingly shaped by a third demographic phenomenon—one that may be a reaction to the enormous growth in developing regions. Perhaps more than at any time in the past, residents of the poorest nations are making the decision to move across international borders, sometimes illegally, in search of a better life. Humans have always been peripatetic, but with

Figure 1. Latin American Birth, Death and Natural Increase Rates and Total Population: 1960-2025



Source: Centro LatinoAmericano de Demografia, *Latin American Demographic Situation as Assessed in 1980*, Series A, No. 168 (Santiago, Chile: 1981)

the emergence of nation states and political barriers in the late 19th and early 20th centuries migration had become relatively controlled. However, with recent spectacular advances in communications and transportation facilities, added to the staggering poverty in developing regions (caused at least in part

by rapid population growth), more and more people are ignoring these constraints and are moving despite the possibly dire consequences. This is happening all over the planet, not only between developing and developed nations, but also between less affluent and more affluent developed countries, as from Portugal to France and Italy to West Germany, and between the poorest developing nations and their somewhat better-off neighbors, as from Egypt to Saudi Arabia and Colombia to Venezuela.

In 1948 the noted sociologist and demographer Kingsley Davis wrote:

> "Demographically the potential migration pent up in today's world is enormous. Not only is the earth's total population increasing at the fastest rate ever known, but the increase is extremely unequal as between regions. . . . As a result the previous inequalities of population distribution are being aggravated rather than alleviated. . . . Between the two kinds of areas the differences in level of living are fantastic. What more natural than to expect the destitute masses of the underprivileged regions to swarm across international and continental boundaries into the better regions? Like the atmosphere, the earth's population is characterized by high and low pressure areas, and one expects an inevitable current of migration from one to the other. Actual migration, however, is not governed solely by high and low pressure. It is governed by economic costs, political barriers, ethnic attitudes, and limited horizons. These barriers have slowed down migration to a snail's pace. One wonders how long the inequalities of growth between major regions can continue without an explosion."[14]

Davis' questions are now being answered by millions upon millions of people who are giving up their long accepted ways of life in search of something better. They may be legal immigrants whose decision to move results from considerable discussion and thought. They may be refugees forced to abandon their homeland because of political strife. They may be illegal immigrants who surreptitiously enter a country and lead guarded lives for fear of apprehension.

Together, these three demographic phenomena stem from the behavior of all of us as population actors; together they will contribute to the new and exciting era of the 21st century. Interestingly, all three demographic processes—fertility, mortality and migration—are involved in these trends: (1) In the developed regions, fertility has fallen to historical lows; (2) In developing regions, mortality has fallen considerably and fertility is beginning to fall); (3) Throughout the world, massive migration is taking place as more people than ever search for what might be a better life. Understanding these three demographic changes is essential in any attempt to examine the future population of planet Earth.

Planet Earth's Population: 1984

At the outset of 1984, the planet's numbers are fast approaching the five billion mark. The population of planet Earth has more than tripled in the past century from about 1.5 billion in 1884 to nearly 4.8 billion in 1984 (see Table 2). It has doubled in the 39 years since the end of World War II in 1945 and would double again in the next 39 years if the current estimated growth rate of 1.8 percent a year were to continue. These are disturbing statistics to consider.

The 4.8 billion inhabitants of planet Earth are far from being equally distributed. Some 22 percent of the world's population resides in China, which has only 6.5 percent of the world's land area. Within China, about 94 percent of its some 1.03 billion people live in just 45 percent of the nation's territory.[15] Australia, the sixth largest country in terms of land area, is home to only 15 million people. Urbanization appears to have accelerated in all countries and about 40 percent of the world's population now lives in urban areas.

More important are the dramatic differences between the population statistics of less developed and more developed

12

Table 2. World Population: 1884-1984

Year	Population (in millions)
1884	1,514
1890	1,564
1900	1,650
1910	1,805
1920	1,860
1930	2,070
1940	2,295
1945	2,402
1950	2,526
1955	2,757
1960	3,037
1965	3,354
1970	3,696
1975	4,066
1980	4,432
1984	4,760

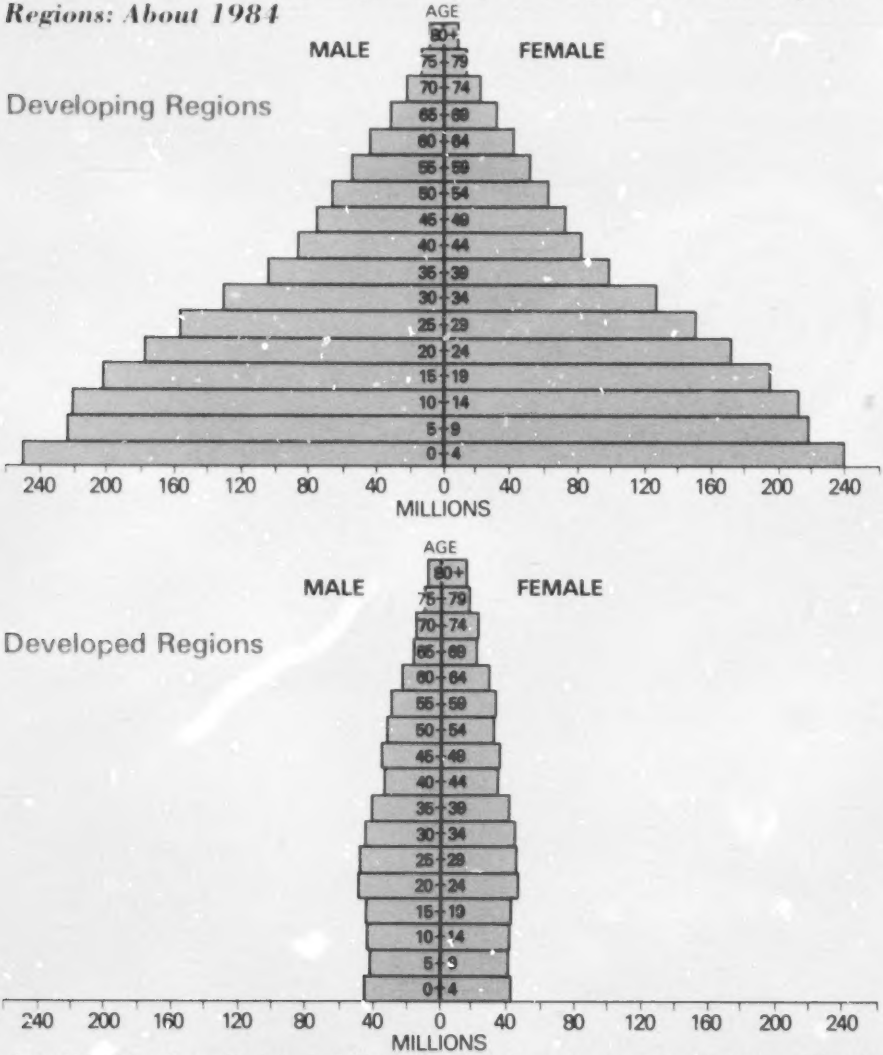
Sources: 1884-1945: Estimates given or derived from United Nations, *The Population Debate: Dimensions and Perspectives: Papers of the World Population Conference, Bucharest, 1974*, Vol. 1 (New York: 1975) Table 1; 1950-1980: United Nations, *Demographic Indicators of Countries: Estimates and Projections as Assessed in 1980* (New York: 1982) p. 59; 1984: Population Reference Bureau estimate.

countries. About 75 percent of the world's population lives in less developed countries. In the rich developed countries as a whole, natural increase currently averages 0.6 percent a year which, if continued, would double their populations in 125 years. The average for the poor developing nations as a whole is 2.1 percent a year—a population "doubling" time of just 32 years. Inhabitants of rich countries can expect to live 73 years on average; those in the poorer developing nations, 58 years. Women in more developed countries currently averge 1.9 live births each in their lifetime; those in poorer countries, 4.5. As a result, the age composition of rich and poor nations differs radically, as seen in the population pyramids shown in Figure 2 (page 12). In the developing world, some 38 percent of the population is comprised of children under age 15 with their childbearing years still to come, versus 23 percent in the developed world as a whole. (Compare the broad base of the population pyramid for the developing regions with the narrow base of the pyramid for the developed regions.) Thus the built-in momentum for population growth is much greater in less developed than in more developed countries. This means that even if miraculously all women in the world were from now on to average only enough children to replace the parent generation (2.1 to 2.5 children, depending on mortality conditions), births would continue to outstrip deaths and populations thus grow far longer and relatively much larger in developing countries because of the higher concentration of people in the childbearing ages compared to those in the older ages where most deaths occur.

Reducing fertility

Several current demographic issues are controversial. One controversy rose to a pitch at the 1974 World Population Conference—whether reducing population growth requires more emphasis on family planning programs to make available the means for reducing fertility or on socioeconomic development to increase couples' motivation to reduce fertility. The Third World slogan, "Development is the best contraceptive," became well known, though not widely accepted. Some consensus has followed this heated debate; now most scholars as well as policymakers feel that both economic development and contraceptive utilization must be improved if population growth rates are ever to subside in many developing nations.[16] Some political leaders, however, remain reluctant to initiate family planning programs, partly out of fear that people will not accept them. But several developing nations have succeeded in reducing fertility to well under three births per woman: examples include Barbados, Cuba, South Korea,

Figure 2. Population Age Pyramids of Developing and Developed Regions: About 1984



Source: United Nations, *Demographic Indicators of Countries: Estimates and Projections as Assessed in 1980* (New York: 1982) pp. 61 and 63, data for 1985.

Taiwan, and, of course, China. There are also many who have failed to reduce the rate below six births per woman: Bangladesh, El Salvador, Kenya, Nigeria, Pakistan, to name but a few. Two questions must be answered in order to reduce fertility markedly among the three-quarters of the world's population living in developing countries and thus to slow planet Earth's overall population growth

rate. First, in those countries where success is almost nil, what new approaches should be tried? Second, in those countries where some success has occured, how can the pace be quickened to speed up the attainment of replacement-level fertility?

Interestingly, *low* fertility is seen as a problem in some countries. Some West Germans have lamented that "between the sheets we are a dying nation." Some Eastern European countries have tightened their very liberal abortion laws and stepped up pronatalist incentives in the hope of raising fertility. In some countries, such as Guyana and Nigeria, ethnic groups still vie with each other to become or to remain dominant numerically. Thus not all nations espouse lower fertility. Indeed, in certain less developed countries where fertility is quite high, the leadership remains convinced that there is room for expansion and committed to population growth. In Malaysia, for example, although there is a strong family planning program and fertility has been reduced to 4.3 births per woman, the Prime Minister recently argued that his nation could easily support 70 million people, nearly five times the present number.[17]

Lowering mortality

High mortality is a problem wherever it exists. Still to be found in sub-Saharan Africa and some Asian countries but intolerable in 1984 are life expectancies at birth as low as 45 years and infant death rates of 150 and upward per 1,000 live births. Though sub-Saharan Africa's mortality rate has been reduced in the past decade it remains higher than in any other region. Reducing it further should be given high priority on the national as well as world level.

Ironically, lower mortality, while a goal to be sought by all governments, contributes to other problems. In developing regions, as noted, declines in mortality without matching declines in fertility have resulted in inordinately high population growth rates and the impact is felt for

Table 3. World's Ten Largest Urban Agglomerations: 1984

Rank	Urban area	Population (in millions)
1.	Tokyo-Yokohama	21.3
2.	Mexico City	18.8
3.	New York metropolitan area	18.2
4.	Shanghai	17.0
5.	Sao Paulo	14.5
6.	Beijing	14.1
7.	Los Angeles-Long Beach	10.8
8.	Greater Buenos Aires	10.7
9.	Rio de Janeiro	10.2
10.	Seoul	9.9

Source: Derived from United Nations, *Estimates and Projections of Urban, Rural and City Populations, 1950-2025: The 1980 Assessment* (New York, 1982) Table 8, p. 61.

generations. In the advanced nations, low mortality has increased the proportion of elderly persons and the burden of providing the economic and medical support they need.[18] Yet life is the most precious of all our possessions and there is no justification for differences in longevity due to factors extraneous to the individuals concerned.

Increased migration

For decades, reducing fertility has been of most concern to population watchers. While that is still important, migration could become the most critical population issue in future years. *Within* developing nations, people are streaming from rural to urban areas and metropolitan centers in particular. As Table 3 shows, seven Third World cities now rank among the ten most populous "urban agglomerations" in the world. By contrast, in the most advanced nations—from Japan to the United States—city centers are losing population as more and more urbanites move to suburban fringes and beyond.

Movements of people *between* nations may be at an historical peak, counting all such movements: legal migration into and out of countries; refugee flights from and returns to homelands; and illegal "revolving door" migration in which millions of individuals move into neighboring

Lars Ashorn—UNHCR

Many of the 15 million refugees contributing to unprecedented international migration are in African countries incapable of supporting them, like these Ethiopian refugees in Somalia.

countries, return home either as planned or as the economy falters, and then repeat the process. Migration streams have shifted dramatically in recent years and by 1984 are generally from less developed to more developed nations, or from "south to north." Refugees now number some 15 million throughout the world, many of them in African countries which are incapable of supporting them.[19]

The United Nations Charter on Human Rights promulgated in 1948 guarantees the right of people to leave and enter their country of origin but says nothing of the right of persons to enter other countries. Quite possibly, however, the right of people to move about the globe as they wish is an issue whose time has come.

Together these variations in fertility, mortality and migration are creating demographically different societies, some still very young, many getting older, others already old and getting even older. This refers to demographic median ages—the point at which half a country's population is younger and half older. Table 4 lists the ten youngest and ten oldest nations in 1984. Most developing countries are young, with a population median age well under 20. With up to half of their populations under age 15, their potential for population growth is enormous and they are burdened with the problems of feeding and educating these large numbers of children and finding the jobs and housing they will need as they grow older. At the other extreme, the demographically mature countries like Sweden and West Germany have median ages approaching 40, and 13 to 17 percent of their population is aged 65 or more (compared to as little as 2 or 3 percent in developing countries). Here the potential for population decline is significant and expenditures associated with the health and care of the elderly are mounting.

Thus the young and the old, though vastly different kinds of human societies, both have demographically related problems. One can only speculate as to what the future will bring. One thing appears certain: the demographic transition is complete or nearly so in most developed countries. The classic "demographic transition" model, hotly debated by demographers since it was first proposed in the 1930s, posits roughly four stages in a country's history of population growth or "natural increase" (migration is not considered in the model). Loosely, these are: (1) high birth and death rates, resulting in little population growth; (2) death rates begin to fall while birth rates remain high, resulting in rapid population growth (the excess of annual births over deaths increases); (3) birth rates begin to fall while mortality continues to fall, resulting in declining but still considerable population growth; (4) fertility hovers around replacement level accompanied by low death rates, resulting in very low or no population growth (annual births barely outstrip, or match, annual deaths). This last has been labeled the stage of "incipient" or threatened population de-

Table 4. Ten Youngest and Ten Oldest Countries: About 1984

Rank	Country	Population median age	Percent of population under age 15	Percent of population aged 65 or more
	Youngest countries			
1	Botswana	14.2	49.9	2.6
2	Kenya	14.3	51.8	2.6
3	Liberia	15.8	48.1	2.6
4	Malawi	15.9	48.2	2.6
5	Syria	16.0	48.0	2.9
6	Nigeria	16.1	47.8	2.5
7	Zimbabwe	16.1	47.7	2.7
8	Algeria	16.3	47.1	3.3
9	Ghana	16.4	47.1	2.3
10	Libya	16.7	46.4	2.8
	Oldest countries			
1	Sweden	37.6	17.8	16.9
2	West Germany	37.6	15.8	13.6
3	Luxembourg	37.4	16.5	13.6
4	Switzerland	36.5	17.6	13.7
5	Denmark	35.7	19.3	14.7
6	Italy	35.7	19.6	13.5
7	United Kingdom	35.5	18.6	15.0
8	Austria	35.5	18.2	14.1
9	Belgium	35.3	15.8	13.4
10	East Germany	35.2	18.7	14.2

Source: United Nations, *Demographic Indicators of Countries: Estimates and Projections as Assessed in 1980* (New York: 1982), data for 1985.

cline. Developed nations are in this stage and some have already moved beycnd it to a period of actual population decline as annual deaths exceed annual births. This heralds a new era on planet Earth.

Some Non-Demographic Assumptions

As noted earlier, a close relationship exists between demographic change and other changes that transpire on the planet. Such a relationship was demonstrated as the industrializing, now developed countries reached the seccnd and third stages of their demographic transition and is apparent now that they are moving through and beyond the final stage. Thus it is vital to consider important non-demographic factors that enter into any projections of planet Earth's population in 2034. Relying on the knowledge and views of experts in each field, these are our assumptions for the next 50 years in four non-demographic areas: nuclear war and international relations, natural resources and space exploration, scientific and technological developments, and political and economic structures.

Nuclear war and international relations

There will be no Third World War, nuclear or non-nuclear. To assume otherwise would, of course, negate whatever value this *Bulletin* might have. Thus, while such a conflagration is certainly possible, we must assume that it will not happen at least in the next half century.

But other reasoning lies behind this optimistic assumption. For one thing, the two current superpowers—the Soviet Union and the United States—are entering new stages of societal living. The United States is among the leaders in the emerging computer-robotic revolution; the Soviet Union lags far behind. Can the Soviet Union continue to fall behind and remain a superpower? Militarily, probably, but not economically and politically. Though the Soviet Union will continue to rival the United States militarily, we assume that its relationships with the West and the United States in particular will improve with the shift to a new younger leadership, which—to judge from the age and uncertain health of Premier Andropov—will soon be forthcoming in that nation. Soviet expert James Billington recently wrote: "There is, I believe, a reasonable likelihood that the forthcoming generational change of leadership [in the Soviet Union] may bring with it greater change in policies

than at any time since Lenin moved from War Communism to his New Economic Policy in 1921."[20] We assume, equally, that new leadership in the United States will see a return to the gradual rapprochement with the Soviet Union evident until the election of Ronald Reagan, further easing the recent tensions between the two major powers.

Although we assume no world war directly touched off by the United States or the Soviet Union, we recognize along with experts that recurring local wars could escalate into major nuclear or nonnuclear conflicts within the next 50 years, forcing the United States and the Soviet Union into confrontations that neither wants.[21] Among the danger points are: the Middle East, with its continuing conflicts within and between Arab states (Israel is likely to make peace with its neighbors); Central America, with the mounting frustration of its poor and exploding populations; Southern Africa, where native blacks within and surrounding South Africa will sooner or later move to regain the land lost to the descendants of European settlers. Here, we must assume that even though the overriding influence of the United States and the Soviet Union will lessen during the next 50 years, their common interest in avoiding confrontation will somehow work to contain these regional outbreaks and to prevent further nuclear proliferation. Further, we assume that peace movements, already strong in Western Europe and growing in the United States, will spread sufficiently to brake the buildup of arms and restrain national leaders from dragging the people of planet Earth into insane wars.

Natural resources and space exploration

Making assumptions about the future availability and utilization of natural resources is particularly difficult. Some observers are convinced that the planet is already populated beyond the point where all its inhabitants can be adequately supported and sheltered.[22] Others feel the planet can support many more billions. American researcher Roger Revelle, for example, argued in the mid-1970s that with "relatively high-yielding cultivation" using present technology (including irrigation) applied to all potential cropland, the world could produce enough "for a minimum diet of 2,500 kilocalories per day for nearly 40 billion people."[23] In a recent article, Danish engineer Bernard Gilland labels such a vision "a nightmare to be avoided at all costs" and disputes Revelle's estimate of potentially arable land. He calculates that the planet could produce enough to provide a "reasonable" daily allowance of 9,000 kilocalories per person (for food, animal feed, and seed) for 7.5 billion people. Thus, he warns, this recommended dietary allowance cannot be realized as a world average unless the global population declines to this level after reaching a peak, as now projected, somewhere between 9 and 12 billion.[24]

In this *Bulletin* we assume that food, water, mineral and energy resources will be sufficient to sustain the people of planet Earth at least for the next 50 years. Famines will occur, particularly in parts of Africa and Asia and perhaps in Latin America, but these will reflect unequal distribution of food more than actual shortages. Our assumption of worldwide resource adequacy for the next 50 years does not deny the continued presence of true starvation and shortages of essential nonfood resources in many parts of the world or among the poor within nations. It merely suggests that solutions are available if money, brainpower and good will are directed toward solving the problems. Scientific advances can save the day. Chemist Bruce Merrifield is confident that "we are on the verge of major scientific advances that will enhance the productivity of land, water and raw materials around the world."[25]

Food supplies can be stepped up with wider application of "Green Revolution" technology, improved strains of plants and animals, new techniques that make

tropical agriculture more productive, and aquaculture. Water shortages can be overcome by more recycling, conservation, and—by the early 21st century—widespread desalinization of seawater. Many metals and wood will be replaced by composite materials derived from virtually limitless substances, such as silicon, magnesium and titanium. New mineral sources will be accessible with new extraction methods. More minerals will come from ocean bottoms and from developing nations eager to sell their resources (although problems could arise if certain developing nations with near monopolies of critical minerals must, or choose to, cut off supplies, such as South Africa with its chromium). Sufficient energy will be available with conservation to stretch out dwindling reserves of oil and natural gas, more derivatives from plentiful coal, more use of solar, wind and hydroelectric power in areas where such resources are abundant, and increased use of nuclear power—fission (as its problems are overcome) and perhaps the beginning of nuclear fusion at affordable cost.

Continuing progress in space exploration and utilization suggests that space will begin to provide for some of planet Earth's needs in the next 50 years. Orbiting collectors will gather solar power to be beamed to earth for conversion to electricity. Robots will transport minerals from the moon and search for other sources in asteroids and, eventually, other planets. Robots will also operate factories in space. The first space colonies will be in orbit, manned by experts, although there is no [illegible] within the next 50 years of establishing colonies in space or on other planets large enough to siphon off some of the world's overpopulation, as has been suggested.[26] The United States and the Soviet Union are likely to cooperate in the enormously expensive exploration of space, despite probable objections by politicians on both sides.

In a word, we assume that resources will be available to sustain humankind in the next half century, although living standards may improve only marginally, or not at all, for many among the masses living in what are today's developing nations and may even slip for some groups within the currently developed nations.

With computers, education can be tailored to individuals and available over a lifetime, leading to better educated populations than ever before.

Science and technology

Exponential growth—a term most used to describe population increase—is also appropriate to depict the progress to be expected in science and technology in the next 50 years.

Even with the recent incredible progress in development of computers, particularly microcomputers, we are still only entering what will be the most exciting era in communications in planet Earth's history. Today one silicon chip can hold close to half a million data bits through which information is sorted. By the turn of the century, it is expected that some two billion data bits will fit on one chip. With computers, education can be tailored to

individuals and available over a lifetime, leading to better educated populations than ever before. With computers and further developments in satellite communication, the latest knowledge can be made available almost instantly to people throughout the world.

The discovery and future promise of the microchip are leading to a robotic revolution. Robots already perform many routine tasks. Fast being developed are computers with "artificial intelligence"—thinking robots "able to explore significant mathematical, scientific or engineering alternatives at a rate far exceeding human ability," according to a recent U.S. National Research Council report.[27]

Medical advances promise to enable planet Earth's inhabitants to live longer, healthier lives than ever before. Developments in genetics, for example, will lead to cures for many diseases, including cancer, elimination of others, and could even make it possible to slow the aging process itself. "The ability to control DNA [the genetic blueprint of life] will be more significant than the discovery of fire or the printing press," says Donald Coffey of the Baltimore Johns Hopkins University School of Medicine.[28] Gene therapy, sex predetermination, even the creation of life will probably become routine in the next 50 years.

Contraceptive technology has already made great strides. The decades ahead will see much more widespread availability and use of contraceptives to suit every couple: safe, low-cost, still more effective injectables and implants; long-lasting IUDs; vaginal rings; new post-coital methods; routinely reversible sterilization; safe, self-administered methods for early abortion; effective ways to pinpoint ovulation to improve natural family planning; and effective, acceptable contraceptive methods for men.

There will be problems in humankind's adjustment as the world is changed by scientific developments. Can we retrain or find other jobs for the workers displaced by robots at least in developed countries? How will we deal with the ethical issues emanating from biogenetics' increasing ability to create life? On the whole, however, this emerging era promises to be of great benefit to humankind.

Political and economic structures

Capitalism as we have known it for the past 200 years and communism as it has developed over the past 65 years will not prevail through the 21st century. Neither are appropriate for the coming era. Communism has already failed, as even romantic liberal idealists reluctantly admit. Capitalism, too, will wear thin as conservation necessarily replaces consumerism to better husband Earth's resources.

People will continue to work for profit. But gone are the days of the robber barons and early capitalists working for private gain. The 21st century will see the emergence of a new social consciousness. Democracy, as distinct from capitalism, will survive and thrive as it ceases to be bound by capitalist ideology. Political scientist Arthur Bronwell predicts:

> "Democracy will no longer be a dinosaur with an overgrown physiognomy and a stereotyped brain, with intellectualism and professionalism buried somewhere in the belly as an appendage. Its actions will no longer be bounded by the ideologies of the political leaders and the machinations of power politics in a Machiavellian power syndrome. Intelligence and professionalism will develop institutions in the free society context which will enlighten the whole of the political and social advance . . . There will develop a flow of money directly from the people and corporations into the institutions of a free society, but with a far more knowledgeable basis of the contributions which these institutions make to society, as well as their quality and effectiveness in the use of funds."[29]

On the economic front we assume that the developing nations' demand for a New International Economic Order will finally meet with some success in the next 50 years. Currently the differences between the "haves" and the "have-

nots" threaten to grow more extreme as the advanced countries move into high technology and the less advanced countries strive not to catch up but to make some slight progress. Problems will continue as the have-not countries, representing an enormous proportion of the population, make demands on the rest of the world. But we assume that by the 21st century, the democratic world's emerging social consciousness will spread to include a greater sharing of the wealth with less advanced nations. This will also reflect the richer nations realization that their own survival depends increasingly on the welfare, resources and markets of the poorer nations.

These four non-demographic areas will shape the future of planet Earth at least as much as population trends and will be closely related to the course of population change. We have made assumptions about all four that guide the projections of population change presented in the next sections. We assume no world war in the next 50 years, thus mortality rates will not rise dramatically because of warfare. We assume that somehow the global population will have sufficient food, energy and other natural resources to reach 2034. We assume that scientific advances will enable people to live longer, healthier, better educated lives and more readily control their fertility. We assume the end of capitalism and communism and the emergence of a new, as yet unnamed, democratically motivated economic order on planet Earth. With the prospect of a better life, couples in less advanced nations will no longer feel required to have many children to provide unpaid family labor and parental old-age support.

It is important to emphasize that these are assumptions and not predictions. One need simply reflect on the past 50 years to be wary of making predictions. In 1934, would we have expected what transpired over those 50 years? We have suffered through World War II and continual smaller conflicts. We have witnessed the emergence of the Soviet Union as a superpower. We have seen China become the first demographic billionaire. We have marveled at the growth in energy sources, particularly nuclear, and been frightened by the power of nuclear weapons. Man has landed on the moon and space ships have gone beyond the solar system. We have seen the incredibly important invention of the microchip and the latest computer, robot and satellite systems.

What will occur over the next 50 years? As Francis Bacon wisely counseled almost 400 years ago: "Dreams and predictions ought to serve but for winter talk by the fireside." Let us simply hope that our assumptions will prove to be correct. But if they are seen as predictions of things to come, let that be done by a warm fireplace.

Population Change: 1984–2034

Populations change in only three ways: through fertility, mortality, migration. The acts of all of us in these three areas will together yield the population of planet Earth in 2034—its distribution between different regions and between rural and urban areas, its age composition, and, of course, its size. These are our assumptions about changes in the three demographic variables over the next half century—changes shaped by the nondemographic assumptions stated above.

Fertility

Fertility will fall over the next 50 years in all regions where it is now high—sharply in all but a few. Increasingly aware that rapid population growth hinders development, the governments of most developing countries will try to induce their people to accept family planning. Some will go so far as to mandate the one- or two-child family, as is currently in vogue in China and South Korea. On the nongovernmental side, people themselves will realize the benefits of smaller fam-

ies, particularly as infant and child mortality rates fall and as their countries begin to industrialize. And as a result of the contraceptive and communications revolutions, most people on the planet will become aware that they can limit the number of their children if they so desire.

In Latin America, the crude birth rate, now hovering around 31 per 1,000 population overall and as high as 45 in some countries, will probably fall to a regional average of 20 per 1,000 by 2034. (The overall average for developed nations in 1984 is about 15.) Close to or below this average will be countries like Brazil, Costa Rica, Mexico and Venezuela. Others like Bolivia and Ecuador will lag behind, but there, too, fertility will fall.

In Asia, where population density is already intense, most governments will put tremendous pressure on their people to reduce fertility drastically. This will be especially true in China, Indonesia, South Korea, Taiwan, Thailand, and to a certain extent in India. Family planning programs will be stepped up in many countries over the next 50 years. By 2034, replacement-level fertility will be nearly achieved in India, Indonesia and the Philippines, and within sight even in Bangladesh and Pakistan. China, so important in any projections of future world population size, will achieve replacement-level fertility before 2000 and with a fertility rate slightly below replacement in the following decades, will be close to zero population growth by 2034. Thus its performance will rival that of its neighbor Japan, where fertility is already below replacement and could rise slightly over the next 50 years.

Fertility declines will be more modest in certain parts of Africa. In sub-Saharan Africa, the pressure to reduce fertility will not be so evident because of conflicting cultural interests and because mortality will remain relatively high. In some Middle Eastern countries where only minimal attempts have been made to lower fertility, cultural pressures will also keep fertility higher than in other regions over the next 50 years.

Among today's developed nations, only the Soviet Union will witness a fertility decline. In Western Europe, some Eastern European countries, Canada, the United States, Australia, New Zealand, and a few other countries, fertility, already below replacement, will remain at that very low level to 2034. Occasionally, the total fertility rate will spurt upward to 2.0 or 2.1 births per woman, but generally it will be as low as 1.4 to 1.8 and could fall even lower in some countries, given the lack of demand for labor in their increasingly automated industries. With the still high fertility of its non-Slavic minority groups, the fertility rate of the Soviet Union is currently about 2.4 births per woman but will fall gradually to replacement level by 2034.

As the impact of population decline becomes evident, several developed nations may attempt to raise fertility, as Bulgaria, Czechoslovakia, France and Hungary already have. In the 1960s, many people became aware of the significance of exponential growth. Even a 1 percent annual rate of population growth, which would double population numbers in 70 years, could not be allowed to continue indefinitely. At a 1 percent annual rate of decline, a population is reduced by half every 70 years. The latest concern has been reported from West Germany, where the fertility rate has been lowest in the world since 1973 and is now about 1.4 births per woman (see Table 1, page 5). A recent government report pointed out that if the current trend continues, the native population will fall from about 57 million today to 38 million in less than 50 years.[30] The trend already means shortages of military recruits and jobs for teachers and could erode social services as a shrunken work force fails to generate enough revenue to support elderly pensioners. We project little success in raising fertility and thus a number of European countries will lose population over the next 50 years.

Very low fertility in the developed countries and declining fertility rates in the developing countries now comprising

German Information Center

Population decline is likely in demographically mature countries like West Germany with low fertility, high life expectancy, and a large proportion of elderly persons.

three-quarters of global population does not mean an early drop in the annual total *number* of births. Due to earlier high fertility and decreases in mortality, the proportions and numbers of young people in or about to enter the childbearing ages are enormous in the developing countries and the potential for continued population growth thus equally great. Even with fewer births *per woman*, the annual *overall number* of births in the world will increase for at least the next 30 to 40 years before leveling off and falling. Thus the immediate future will be difficult because the numbers added to world population will mount—from about 83 million a year currently to close to 90 million a year by the year 2000. Only sometime later will relief be forthcoming in a narrowing of the excess of births over deaths.

Mortality

As new cures for diseases are discovered and communicated among countries and living conditions improve in developing countries, death rates will fall and improvements in life expectancy will be noted throughout the world.

The gain in life expectancy at birth will be greatest for developing nations where the overall average is currently about 58 years, compared to the average of over 73 in developed nations as a whole. With progress in combatting infant and child mortality and infectious diseases which still take a heavy toll, life expectancy in 2034 could be close to 60 years even in sub-Saharan Africa. At present it is as low as 40 to 45 years in some countries of that region. In Latin America and in some parts of Asia, notably China, the figure may well be up to 70 or 75 years by 2034, the level of developed countries in 1984. We expect the overall average for today's developing nations to be around 70 in 50 years time.

By then life expectancy in developed nations may well hover between 80 and 85 years. This will reflect steady progress in finding cures for cancer and other chronic diseases that affect the elderly and new ways to slow the biological process of aging.

For population growth, such improvements are a mixed blessing, as we have noted. Declining death rates in the 1950s and 1960s in Latin America, for example, led both to increased rates of natural increase then as birth rates had not yet begun to fall and still high rates of natural increase currently. A generation later, despite the drop in the number of births *per woman*, because so many people who would have died in earlier times have survived to have children themselves. The same process can be expected in Africa as mortality decline takes hold there. The resulting high rates of natural increase will doubtless contribute to the inability of that region to make significant socioeconomic progress over the next few decades. Nevertheless, this should not deter Africans, with the assistance of developed nations, from making an all-out effort to combat mortality.

Table 5. World's Ten Largest Urban Agglomerations: 2034

Rank	Urban area	Population (in millions)
1	Mexico City	39.1
2	Shanghai	38.8
3	Beijing	34.5
4	Sao Paulo	32.4
5	Greater Bombay	30.6
6	Dacca	29.2
7	Calcutta	28.9
8	Jakarta	25.8
9	Madras	23.3
10	Tokyo-Yokohama	19.1

Source: Derived from United Nations, *Estimates and Projections of Urban, Rural and City Populations, 1950-2025: The 1980 Assessment* (New York: 1982) Table 8, p. 61.

Migration

With fertility expected to decline in all developing nations, migration, both within and between nations, could quite likely become *the* critical population issue in future years.

Within developing nations, the increase in the proportion of people living in urban areas, or urbanization, will continue at a rapid rate. Metropolises of a size unimaginable just a few years ago will emerge. Mexico City may well reach 30 million by the turn of the century and could be up to 39 million in 2034, having long before displaced New York as the world's most populous metropolis. Cities like Sao Paolo, Jakarta and Madras will become huge and only one city of a developed nation—Tokyo, with 19 million people—will still rank among the world's ten largest metropolises in 2034 (see Table 5). In the developed nations, the proportion of people living in urban areas is already 70 percent (compared to the current 29 percent in developing nations as a whole) and is likely to increase little if at all as people continue to move from metropolitan areas to less densely settled rural areas, as already observed in the United States, Japan, West Germany and other developed countries.

Urban health and sanitation problems will grow steadily worse in developing countries. More critical will be job requirements, which with the influx of people from rural areas mount more rapidly for cities than for nations as a whole. Already in Central America alone, some 90,000 new jobs must be created every year in metropolitan areas simply to keep unemployment at current rates. By the year 2000, more than 200,000 new jobs will be needed each year to cope with both the flood of job-seekers arriving from rural areas and the increasing number of young city residents reaching working ages. The potential for still more unemployment and social instability is great.

International migration has been an increasing source of concern since the late 1960s and early 1970s in the receiving countries of Western Europe, the Middle East and the United States. Millions of people are on the move. Despite many countries' efforts to limit both legal and illegal immigration, the enormous population growth projected for at least the next 20 to 30 years in many sending countries ensures that such movements will not soon decline. However, the flow from some developing countries may diminish slightly as they begin to industrialize after the turn of the century and can provide more employment for their own citizens. Indeed, one can imagine the Mexican government then being concerned to limit the influx of Central American immigrants into Mexico's new industrialized regions.

For the next few decades, the movement of people searching for jobs and a better life will, as now, be from the developing to the developed nations. Early in the next century the directions may change as the developed countries no longer require additional blue-collar workers and newly industrialized nations like Argentina, Brazil, Mexico and Korea develop needs to fill the lowest level jobs.

Immigration can be expected to make major changes in the cultural composition of presently developed receiving countries like Canada, Sweden, the United States and West Germany. With fertility below replacement, an increas-

Ray Witlin—World Bank

Jakarta, already crowded, will be huge by 2034, like other cities in rapidly urbanizing developing nations.

ingly large proportion of their future population will be recent immigrants from culturally different nations and their descendants. A potentially explosive situation exists in the Middle East where in some OPEC countries large majorities of the population are aliens who are not citizens and can never hope to be. The need for foreign workers will fade as Middle Eastern oil reserves decline and the area's own growing numbers of young people are trained. Will the foreigners be allowed to stay in Iran, Kuwait, Libya or Saudi Arabia or be forced to return to their native lands of Egypt, India, Jordan or Pakistan? This issue could lead to serious confrontations between some of these nations.

Population size, distribution and composition

Together these changes in fertility, mortality and migration will alter the face of planet Earth over the next 50 years. All three demographic variables will contribute to changes in the size, distribution and composition of the planet's population in 2000 and the years thereafter. World population will surpass 6 billion by the turn of the century. This means an increase of some 1.3 billion in just 16 years—significant indeed, but nevertheless reflecting a slight drop in the annual growth rate from 1.8 percent now to 1.4 percent by the year 2000. We should not be misled by this progress, however. A growth rate of 1.4 percent a year, if maintained, would mean a population of nearly 10 billion by 2034 and continued doubling every 50 years thereafter. Soon after the turn of the century, however, quite possibly the growth rate will fall substantially as fertility drops rapidly in most developing nations. The outlook is for difficult times in the near future but less difficult times thereafter.

The world's population growth between 1984 and the early part of the next century will not be equally distributed over the planet. The proportion of global population living in what we now call the less developed regions will increase from 75 to at least 80 percent. This suggests the possibility of more conflicts between the "have-not" nations demanding a new world economic order and the by then nongrowing or depopulating richer nations. By the year 2000, the United Nations projects that over half the world's people will be living in urban areas and more than 65 percent by 2034.[31]

Ever so gradually, humankind will "age," that is, the proportion of older people will grow and that of younger people decline. This will mean increasing expenditures for the care of the elderly even in developing nations. On the other hand, with fewer youths to educate, the quality of schooling should improve in many parts of the world.

Thus, as we move toward 2034 some major changes will be taking place in the population size, distribution and composition of planet Earth, due in considerable part to changes in technology, in resource utilization and in communications. New types of societies will begin to emerge.

*Population in the Year 2034**

In April of this year, the venerable Population Reference Bureau of Washington, D.C., published its 72nd consecutive annual *World Population Data Sheet*. The Bureau, which celebrated its 100th anniversary five years ago, has been publishing the *Data Sheet* since 1962. While still called a "sheet," this is in fact a misnomer, since 2003, the "sheet" has been produced as a microcube, the normal method of publication in this century. The half-inch cube presents 77 different types of population-related data (up from 14 in 1984) for the world's 156 "geopolitical entities" and United Nations members (down from 171 in 1984, with the reunification of West and East Germany, South and North Korea, Taiwan, Hong Kong and the People's Republic of China, and amalgamation of small countries in Africa and the Caribbean that once tried to go it alone).

The *Data Sheet* for 2034 indicates that the world population has just passed the 8 billion mark. Indeed, it is estimated to be 8,028,452,110 as of July 1, 2034. The Population Reference Bureau calculated that the 8 billion mark had been reached on January 27 of this year. It was just 58 years ago that the Bureau attracted considerable attention when it proclaimed that planet Earth had reached the 4 billion mark on March 28, 1976.

The doubling of the world's population in the past 58 years represents an average growth rate of about 1.2 percent a year over that period. This is substantially less than 50 years ago in 1984 when the global growth rate was estimated to be about 1.8 percent a year. Indeed, the *current* rate of growth, according to the *Data Sheet*, is just over 0.6 percent a year. However, this growth *rate*, when applied to the 2034 population base of more than 8 billion, still means a *numerical* increase of about 67 million people a year. This is only about 16 million less than the numbers added annually around 1984 when the then 1.8 percent annual growth rate applied to a population of about 4.8 billion. If continued, the growth rate of 0.8 percent in 2034 would mean a doubling of the planet's population to some 16 billion in 90 years, around 2124. Clearly this cannot be allowed to happen. The past 50 years have seen considerable progress toward the universally desired goal of a stationary, nongrowing world population and fertility is now at or close to replacement in most parts of the world. But we still have a long way to go before world population actually stops growing. There is overwhelming agreement that the growth must end as soon as possible, to be followed by some decline in global numbers.

According to the *2034 World Population Data Sheet*, only about 7 percent of the people on this planet live in what were once called the "more developed" nations, compared to the 25 percent included in this category 50 years ago in 1984. We have long since changed our categorization of world population by "more developed" and "less developed" regions, however, and now classify nations into four types: the service/information societies, with a mere 4 percent of the world's population; the new industrialized nations, with 38 percent of the total; the developing regions, with 43 percent; and the least developed nations, with about 15 percent. India, now with over 1.3 billion people and still growing at close to 1 percent per year, displaced China five years ago as the world's most

*In this and the following two sections, the author breaks all the rules of the demographic profession and *predicts* how the planet will look, population-wise, in 2034. While based on the non-demographic and demographic assumptions presented earlier, these sections move beyond simple extrapolation of those assumptions, or what is called projection, to a prediction of things to come, and are deliberately written as if it were 2034. As Francis Bacon advised, these predictions should be read "by the fireside."

Table 6. World's Ten Most Populous Countries in 2034: Author's Estimates

Rank	Country	Population
1.	India	1.3 billion
2.	China	1.3 billion
3.	Soviet Union	330 million
4.	United States	270 million
5.	Nigeria	265 million
6.	Brazil	260 million
7.	Indonesia	230 million
8.	Bangladesh	220 million
9.	Pakistan	200 million
10.	Mexico	165 million

populous country. China's population has stabilized at just under 1.3 billion. Trailing a long way after the two demographic billionaires in the list of the planet's ten most populous nations in 2034 are the Soviet Union in third place with 330 million and the United States in fourth place with 270 million and then, in order, Nigeria, Brazil, Indonesia, Bangladesh, Pakistan and Mexico (see Table 6). Mexico long ago bumped Japan from the "top ten" list. As the *Data Sheet* indicates, the estimated crude birth rate for planet Earth is 17 per 1,000 population and the death rate, 9 per 1,000 (compared to 29 and 11 per 1,000, respectively, in 1984). Life expectancy at birth overall is approximately 70 years, compared to 62 in 1984. As always, these figures vary significantly among the four regions.

These are the basic demographic data—the raw material that illustrates where planet Earth's population stands in 2034. But what do these facts mean? What changes do they reflect? Let us examine each of the four types of societies to understand both the situation in 2034 and how it evolved over the past 50 years.

Service/information societies

This group includes all of Europe except the Soviet Union and a few other Eastern European countries; the United States and Canada; Australia and New Zealand; and Japan. The Soviet Union has changed dramatically over the past 50 years but is still struggling to become truly service oriented; for reasons discussed later, it has not yet graduated from industrialized to service/information status.

The service/information countries have witnessed below-replacement fertility for at least 60 years. This has been appropriate, given the exceedingly low demand for manual labor and, indeed, for human labor in general. The robotic revolution, together with the information revolution, has resulted in increasing numbers of jobs being performed first by mechanical robots and more recently by robots capable of decisionmaking. Such a change had been anticipated as early as 1982 when two observers wrote: "By 2034, it is conceivable that more sophisticated robots will replace almost all operators in manufacturing .... as well as a number of routine nonmanufacturing jobs."[32]

Such societies have little incentive for population growth. Many people have opted not to have children (or even to marry). Most couples who do have children are satisfied with one. This is appropriate, given the long training necessary to qualify for today's sophisticated occupations and the fact that men and women are equally capable of performing the duties demanded. The total fertility rate in most service/information societies has hovered between 1.4 and 1.7 births per woman.

Productivity has increased considerably as a result of more and more reliance on "steel-collar" robots (replacing the blue-collar workers of 50 years ago) and "thinking" robots (displacing many of the service and professional workers of days gone by). However, low fertility has meant an aging population for all the service/information nations and population loss for some. By the year 2000, almost all Northern and Western European countries (and a few more in Eastern Europe) had joined the few European countries where births already fell short of deaths in the early 1980s. As

the second generation of below-replacement fertility produced so few females, it was impossible to halt the decline in population. Despite the reduced need for workers, concern about diminishing numbers grew. Further, with so few children being born, such societies inevitably are top-heavy with older people and have a median population age approaching 45 or even 50, as seen in the population age pyramid of a typical Western European service/information nation in 2034, shown in Figure 3. These nations began to ask themselves: How can we survive with falling numbers and without youth to develop new ideas to carry on the service/information revolution? One option was to rely increasingly on robots to replace the young population, but robots only reflect the intelligence of the humans directing them, and these humans overall were quite old. The other option was to allow more immigration from countries with surplus populations. But this inevitably results in a major change in the cultural makeup of the host countries.

Espenshade and Bouvier, in 1982, demonstrated that it is possible for a nation with below-replacement fertility to nevertheless achieve a stationary population at whatever level is desired if a given level of immigrants is allowed to enter.[33] Most European nations reluctantly adopted this alternative to maintain their societies, albeit at lower population levels. As organismic demography puts it: "These nations required a blood transfusion and it came from outside the region."

Shortly after the dawn of the 21st century, European nations like Germany (reunited into one nation soon after that), France, Sweden and Great Britain began encouraging a limited number of immigrants who were young and well educated. At first, neighboring European countries were encouraged to send their "best and brightest." Thus, as had been the case before "guestworker" admissions were limited in the early 1970s, Spaniards and Portuguese were enticed

Figure 3. Population Age Pyramid of a Typical Western European Service/Information Country in 2034

Source: Author's projections for West Germany based on the following assumptions for 1980-2034: Total fertility rate constant at 1.46 births per woman; Life expectancy constant at 73.9 years for males, 77.5 years for females; Net immigration constant at 85,000 per year.

to move to France; the Irish to Great Britain; Italians to Switzerland and Germany; Finns to Sweden. Then even those sending countries, themselves worried about losing population, became reluctant to allow emigration and legislated an end to such movements.

The next step for France, Germany and the others was to turn to the Middle East, Africa and even Latin America for new transfusions of young adults. This time, reluctance came from the residents of the receiving countries and racial and ethnic issues became paramount. These nations were beginning to experience what the United States and Canada had

German Information Center

Italian guestworkers arrive in Germany. Low-fertility European nations may again encourage immigration in the 21st century to ward off aging and population decline.

gone through a century or two earlier and what they themselves had experienced in the 1970s as deteriorating economies made foreign guestworkers unwelcome. This time most European countries made a determined effort to assimilate the new groups specially invited to settle permanently, whether Turks, Algerians, Tunisians, Ivoirians, or Colombians. New laws required that the new immigrants not only learn the language of the host country but also speak only that language in public, and the newcomers had to agree to have no more than two children.

New societies have now emerged in Europe—societies which are heterogeneous in composition but which will hopefully remain "German," "French," or "Swedish." It is still too early to tell if the plan has succeeded, but population decline has been arrested and most European countries now have populations stabilized at numbers considered appropriate. Germany enumerated 68 million residents at its most recent census (compared to nearly 80 million in West and East Germany in 1984); the United Kingdom enumerated 52 million (versus 56 million in 1984); and France, 50 million (against 55 million in 1984).

Aging and the threat of population decline have not been as drastic in other service/information nations. Immigration has always been prevalent in the United States and Canada. Indeed, immigration remained a problem for the United States as late as the 1990s, with a large source of potential new residents poised just south of the Rio Grande River as the populations of Mexico and the Central American countries grew rapidly. New legislation drastically reduced illegal immigration in the late 1990s, but the United States has continued to accept between 500,000 and 750,000 persons a year as legal immigrants or refugees. As a result, the U.S. population has never actually declined over the past 50 years and today hovers around 270 million (up from 237 million in 1984). It can be expected to remain at this level for the foreseeable future as 500,000 immigrants are accepted each year and the nation's fertility rate—though never so low as in Europe—nevertheless stays under two births per woman. With slightly higher fertility and a steady stream of young immigrants, the United States has managed to maintain a younger population than European service/information nations; today its median age is about 40 (up from 30, 50 years ago).

The United States, too, has been experiencing major changes in cultural makeup. This has not been so traumatic as in Europe and it has been in the best tradition of the United States over 300 years to adjust to new immigrants. Nevertheless, the United States of 2034 is barely recognizable from that of 1984. Approximately half the population is black, Hispanic or Asian, and white, non-Hispanic influence no longer predominates. Presidents have been of different races and of both sexes, and various areas of the nation encourage

Syukan Gendai

Japan could stabilize its population without immigration by keeping fertility right at the replacement level of 2.1 births per woman.

languages other than English. Indeed, almost every American citizen is fluent in both English and Spanish, though English remains the official language of the country as it has been by law since 1992.

Canada has shaped its population change to achieve a total population stabilized at 35 million (10 million more than in 1984). For some 60 years, levels of immigration into Canada have been determined in part by demographic needs. A 1983 study showed how adjusting immigration to various levels of below-replacement fertility could yield a predetermined nongrowing optimum population size.[34] Since then, annual immigration quotas have been set only after due consideration of current fertility levels.

Australia's population has grown only from 15 to 20 million in the past 50 years. Immigration, particularly of Asians, has been limited, also because of deliberate government policy. Nevertheless, about 30 percent of Australia's population today is not of European stock. But the country is maintaining its European-originated culture and its population size is not falling.

Japan differs from the other service/information societies. To this day it discourages immigration. But with its distinct societal customs and emphasis on a strong family, it has managed to maintain a population fluctuating between 120 and 125 million over the past 50 years by keeping fertility right at or just below the replacement level of 2.1 births per woman. Thus it is the best model on the planet of a pure stationary population not influenced by migration. The ingenuity of the Japanese, long evident in technology, extends to demographic fields as well!

In sum, the service/information nations have stabilized populations, though some are at lower levels than 50 years ago. These are the demographically mature societies of planet Earth; some are somewhat older, particularly in Europe; some a little younger, particularly Canada and the United States, Australia and New Zealand, and Japan. Japan excepted, their future cultural makeup depends greatly on how new immigrants will adapt to the host societies. This may be the most critical population issue facing the service/information societies as we move toward the middle of the 21st century.

Industrialized nations

Fifty years ago it would have been surprising to consider Brazil, Mexico, Malaysia and Turkey as industrialized nations. Yet over the past 50 years, population growth, combined with the aspirations of less developed nations, has fueled tremendous growth in the demand for and thus manufacture of industrialized products of all kinds—machinery, clothing, high-tech products. With the hitherto industrialized nations of Europe and North America abandoning that manufacturing role, other nations might have been expected to rush to fill the breach. In the vanguard were the "less developed" nations already approaching industrialization 50 years ago: the Philippines, for example, as well as

what were then South Korea, Taiwan and Hong Kong.

The huge, almost insurmountable, problem facing these ambitious nations was the rapid population growth occurring in at least some, such as Mexico. But in those countries with a relatively literate working-age population and a strong desire to reduce fertility, the seeds of industrialization were planted and rapidly took root. Some countries have been more successful than others, but generally speaking, the industrialized nations of the world in 2034 include: in Asia, China, Korea (again one nation), Malaysia, the Philippines and Turkey; in Latin America, Argentina, Brazil, Chile, Costa Rica, Mexico and Venezuela; a few Eastern European countries; and the Soviet Union.

The latter is a special case that illustrates the impact of demographic behavior. Traditionally, the Soviet Union had been considered a "more developed" nation. There was some question, however, whether it should be so categorized, given its fairly high proportion of rural dwellers (close to 40 percent in 1984) and the surprising evidence that surfaced in the early 1980s that infant mortality was climbing and life expectancy declining.[35] Increasingly over the past 50 years, demographic trends have slowed development and contributed to social turmoil in the Soviet Union. Life expectancy remains lower than in other traditionally developed nations as military expenditures continue to divert funds from investment in better health-care delivery. The Russian ethnic group—long dominant in the nation—ceased to replace itself (as did the Ukrainians and Belorussians, the other two Slavic groups) and has been a minority since before 2000.[36] The country's non-Slavic ethnic groups, whose fertility remained well above replacement until recently, have grown steadily in size and influence. This has braked technological development as the central government's authority has been diluted and also because the non-Slavic groups remain somewhat less educated than Russians, still not fluent in the country's main language, and reluctant to abandon the habits of their more traditional societies. Although the Soviet Union is still one of the planet's major powers, these demographic factors have contributed to its failure to progress to service/information status by 2034.

Mexico will be an industrialized nation in 2034, though still struggling with rapid population growth.

Other nations in the industrialized category but close to the service/information borderline include China and Korea. China's situation is interesting in that it limited fertility prior to industrialization and this contributed to its becoming an industrial giant. Benefiting from the capitalistic experience of the formerly independent regions Taiwan and Hong Kong, China, with its benevolent socialist government, is the major growing power of the world as we approach the mid-century mark. Apparently close to fruition is the prediction made in 1983 by economist Masaya Miyoshi of its now service/information neighbor Japan:

"The 21st century will be the century of the Pacific Region—specifically, Asia. Japan will

not enlarge its sphere of the world economy singlehandedly. Countries like South Korea, China, Taiwan and others will have higher [economic] growth rates than other regions with developing nations. Japan, good or bad, will benefit from being surrounded by these fast-growing economies."[37]

Other new industrialized nations like Brazil and Mexico are struggling because of continued rapid population growth. True, their fertility rates have fallen rapidly and are now just about at replacement, but the built-in momentum for population growth remains. In 2034, Brazil's population has just passed 260 million, Mexico's is at 165 million, and more growth is anticipated for the near future. These nations are aware that growth must be limited even more, and soon. Interestingly, both Brazil and Mexico are experiencing problems with immigration from their less fortunate neighbors as has been the case for many decades for Venezuela whose progress as an industrialized nation preceded that of Mexico's because of earlier exploitation of its oil reserves—now close to depletion, as are Mexico's.

These, then, are the industrialized nations of the world, comprising some 38 percent of world population and still growing, though at an ever lower rate.

Developing countries

This category includes the largest proportion of world population (43 percent) and the most countries. These countries remain to this day somewhat more rural than urban. But the cities are growing, close to three-quarters of the adult population is now literate, and fertility has fallen rapidly, particularly in the last one or two decades. With any good fortune, some such nations could advance to industrialized status within the next 50 years. The category includes: in Asia, India, Indonesia and Pakistan; in Africa, Azania (formerly South Africa), Ivory Coast, Kenya, Nigeria and Zimbabwe; in the Middle East, Egypt, Jordan and others; in Latin America, those countries not already industrialized.

Ray Witlin—World Bank

Assembly-line manufacturing transferred from more advanced nations could help ease India's unemployment problems by 2034.

India illustrates how high fertility has hindered these countries from advancing to industrialized status. Already 50 years ago, India was the world's ninth largest industrial nation in terms of total output. But the beneficiaries were limited to a relatively small educated upper and middle class who had begun to limit fertility to two or three children per family. Providing jobs for the masses of uneducated high-fertility rural and city dwellers has been an almost insurmountable problem. Now this has begun to ease with more and more assembly-line manufacturing transferred both from the service/information societies and newly industrialized nations, increases in direct foreign aid, and, most important, a recent rapid drop in the national fertility rate to within sight of replacement level. India's leaders are aware that the enormous numbers and proportions of children and young adults guarantee that the population will continue growing rapidly for decades to come and are applying pressure to reduce the fertility rate even further.

Emigration substantial enough to

serve as a safety valve has not been feasible for India, Indonesia and Pakistan, relatively isolated from more advanced nations except for the Soviet Union and China, which totally prohibit immigration, and Australia. Korea, Malaysia and the Philippines, which together admit only a few hundred thousand a year. Nor has it been an important outlet for the excess populations of the few African nations in the developing category. But desperate, job-hunting citizens of developing nations in Latin America have migrated in ever increasing numbers—some legally to Western Europe and the United States, but most illegally to the few more fortunate, now industrialized giants of the Latin American region.

Least developed nations

The last category, with about 15 percent of Earth's population, includes most of sub-Saharan Africa other than the five developing nations listed above, Bangladesh, some Middle Eastern countries, and a few other isolated cases. These nations present planet Earth with its most critical demographic problems in 2034. In most, fertility has only recently fallen below four births per woman and mortality is still falling; thus, population growth is rapid. Mass deaths from starvation and epidemics bred by overcrowding are a constant threat and sometimes a reality, as in Bangladesh in 2015. In that year, nearly 10 million Bangladeshi died in hunger riots, struggles with Indian border officials, and raging epidemics of typhoid and other infectious diseases before adequate aid could be marshaled. This jolted that nation's leaders into mandating a one-child family, but with limited success so far. The population is already at 220 million—in a land area the size of the state of Arkansas—and migration to India is now impossible. Sub-Saharan Africa, however, is awash with refugees and illegal migrants from similarly rapidly growing, desperately poor nations. So far only massive infusions of aid have assured these nations' survival. But there is a question of how long this can continue.

A new demographic transition model

For many decades, the demographic transition model, developed some 100 years ago by American demographers Frank Notestein and Warren Thompson, described the changes in population growth to be expected as societies progress.[38] To be sure, there were many criticisms of the model.[39] Nevertheless, it did serve as a useful guide to the fertility and mortality patterns already observed and to be expected in future years.

With the appearance of below-replacement fertility in the 1970s and 1980s and its continuation to the present day in the service/information societies, a new model has evolved among 21st century demographers, again with numerous criticisms, but still a rough description of what has occurred and what may follow in societies as they move along the road of progress. The new model borrows from the earlier transition model, but eliminates the first stage where high death rates matched by high birth rates result in very little population

Overcrowding could reach crisis proportions during the next 50 years in fast-growing Bangladesh.

growth. With improvements in medical technology and in communications and transportation, mortality has fallen sufficiently everywhere to make such a stage nonexistent in 2034. The new model borrows its terminology from biological sociology. It describes four stages, called Youth, Adolescence, Adulthood and Seniority to reflect variations in population median age. All the nations of the world can be categorized as currently in one of these stages, although some are borderline cases.

In the Youth stage, fertility is high but falling, with crude birth rates around 30 or 35 per 1,000 population, and even as high as 40 in some nations. Death rates are falling rapidly and as a result, rates of natural increase are at least 2.0 percent a year. This is well down from the overall average of 3.0 percent in Africa, for example, 50 years ago, but if continued, the 2.0 percent growth rate would double these nations' populations in 35 years.

In the Adolescence stage, growth is still occurring. Birth rates have fallen to the mid-20s per 1,000 population but death rates have plummeted to around 8 or 10 per 1,000. Average annual growth is around 1.5 percent (a population "doubling time" of 46 years), but fertility is quite low and growth is accounted for by the rapid decline in mortality.

In the Adulthood stage, there is no natural growth. Birth and death rates tend to equal each other; sometimes one is higher, sometimes the other is. This marks the beginning of the period beyond the demographic transition and corresponds to the final stage in the original demographic transition model.

The Seniority stage is the final category in the new model. Here deaths steadily outnumber births. As the proportions of elderly persons increase and populations age, death rates per 1,000 population climb and birth rates per 1,000 fall even more so that population numbers fall ever more rapidly.

The final stage in the original model, labeled the stage of "incipent" or threatened population decline, hinted of a fifth stage, now realized in the Seniority stage. This final stage of the new model also presages a fifth "stage," this one the ultimate result of continued excess of deaths over births—"demographicide," or the end of a society.

As with the earlier model, migration is not considered in the new demographic transition model. However, as noted, migration can serve as a transfusion to ward off a nation's entry into or progress through Seniority; it can also serve as a safety valve for the rapidly growing nations in either the Youth or Adolescence stages. Even with migration left out, the new model is a useful outline of the population changes occurring as we approach the middle of the 21st century.

The Non-Demographic Picture: 2034

We have all been busy demographic actors over the past 50 years. Almost all of us on planet Earth decided to have fewer children than earlier generations did. Many of us decided to move, often across international borders. Most of us have lived longer than the average human ever did before in the history of the planet. All these changes in demographic behavior have been influenced by changes in important non-demographic factors.

Nuclear war and international relations

It has now been almost 90 years since the end of World War II. Relatively speaking, the planet is at peace. True, we have seen a number of smaller regional wars over the past 50 years, particularly between 1985 and 2010. Regional rivalries continue; China's growing power is seen as a threat, certainly by the Soviet Union. Yet we have managed to avoid nuclear confrontation. With hindsight, we can see that this can be attributed to the nuclear disarmament

movement, beginning in the 1980s. Aided by the newly developed communication technology of that period, which revealed to more and more people the total destruction that would sooner or later follow even a "minor" nuclear exchange, the movement succeeded in recruiting hundreds upon hundreds of millions of supporters. This eventually led to the ousting of political leaders bent on playing war games with the lives of their people.

International relations have improved in the process, due in large part to migration and the resulting cultural changes in some countries. In Europe and the Americas especially, humans have finally begun to think more internationally, perhaps in part because of the changing nature of their own societies, but also because they are becoming increasingly aware of the growing interdependence of nations of this planet. The concept of nation is slightly blurred as we move toward the mid-21st century. Nations still exist, to be sure, but we are more and more aware of our neighbors and their needs and the importance of assisting less fortunate nations. This interest and concern took on a practical shape in the early 2000s as threats of war declined and the major powers began allocating fewer dollars for military arsenals. To us in 2034, it appears positively ridiculous and immoral for a nation to dispense some 24 million dollars per hour in military expenditures. But that was the U.S. military budget in 1983.[40] Relieved of this burden, the advanced nations now in the service/information category allocated for aid to the developing and least developed nations proportions of their national budgets that reached several times the target of 0.7 percent of Gross National Product recommended back in the 1960s and subsequently reached only by Denmark, the Netherlands, Norway and Sweden. The result was not only a vast improvement in international relations but also a tremendous boost in the world economy, just as international economists and Third World countries had argued in vain in the 1970s and 1980s. With developing nations able to finance their increasing consumer demands, both they and the new industrialized nations profited. And the least developed nations survived.

Natural resources

Fifty years ago, the world was concerned about its ability to feed all its people and to find the resources to continue energy consumption at the levels of that period. Increased pollution was also a major concern. These problems remain with us today. Somehow humankind has managed to plow along, very awkwardly finding ways to increase food production and mineral supplies; learning to conserve energy and developing renewable sources of energy, such as solar power, as alternatives to now nearly exhausted oil and natural gas reserves and environmentally hazardous use of coal; and tackling the global pollution that has escalated with the growth of huge metropolises in all but the service/information nations. But the problems remain critical; indeed, more critical than just 50 years ago, for the obvious reason that planet Earth's population has nearly doubled in the interim.

On the brighter side, it is true that advanced nations are allocating more and more funds to research in these fields. Hope springs eternal that newly discovered minerals from the moon and even other planets may eventually meet some of our needs. And we have learned ways to improve the safety of nuclear fission, and widespread use of renewable, nonpolluting, relatively safe nuclear fusion appears to be a possibility within our lifetime.

Space exploration

This has certainly been one of the high points of Earth's history over the past half century. We have explored the planets of this solar system, although very few humans have set foot on these mysterious bodies in space. The Viking 2 that touched down on the planet Mars in Sep-

tember 1976 carried the first robot used in space exploration. A few years later it was predicted: "If we succeed in creating orbiting space colonies or industrializing the moon, asteroids and other planets, it will be with major assistance from robots."[41] Space colonization and industrialization have been deferred as impractical in solving our current population and employment problems. But improvements in robotics have indeed made it possible to send thousands of robots to the moon and even some planets to return with samples of minerals in which much of the hope for Earth's survival has now been placed.

Technology

Technology has made tremendous strides over the past 50 years. Communication is now instant throughout the planet. This has had a tremendous impact on all facets of human life, especially contributing to improvements in international relations and in the world economy. Progress has also been dramatic in biology and human genetics. Predetermining sex and fetal impairments or diseases that could be fatal to newborn infants is now routine. We have developed new methods of early abortion so that the number of unwanted or unplanned pregnancies resulting in birth is almost nil in the more advanced nations. This has further reduced infant mortality and fertility. The ethical issues associated with biological and genetic development still remain unresolved. But overall, scientific and technological progress has been of great benefit to humankind.

The economy

The aforementioned drive to assist the least developed and developing countries after the year 2000 was perhaps the most successful program ever attempted on planet Earth. The emergence of a new economic order, together with the demise of capitalism and communism, augurs well for the future of the planet. With resources scarcer than ever and pollution from industrial growth escalating, finally there is general agreement that continued economic growth is not necessarily good. This is in line with the arguments put forth 60 years ago by economist E. P. Schumacher in his widely admired but then little heeded work, *Small is Beautiful*.[42]

Population outlook

The picture of world population in 2034 shows zero growth only in countries comprising 4 percent of the total population. Zero growth is far from a reality on the planetary level and the concerns with overpopulation expressed in 1984 are even more acute in 2034. Clearly the planet's present 8.03 billion population cannot be allowed to double in the next 90 years as it would if the current growth rate of 0.8 percent a year were to continue. However, there is growing optimism that growth can be slowed drastically and zero growth achieved in the near future, followed, hopefully, by some reduction in total world numbers. The next few decades must and can bring solutions to the problems of still rapid population growth in sub-Saharan Africa and especially in the Asian giants of India, Bangladesh and Pakistan. Stopping the growth of planet Earth's population at a peak somewhere between 10 and 12 billion appears possible within the next 50 years, just as projected by the United Nations as long ago as the early 1980s.[43] This, however, can be achieved only if the fertility rates of the developing and least developed countries immediately fall the remaining small distance to replacement level and then are reduced still further in the most populous of these nations.

Toward a New Society?

Today in 2034 one may wonder why the Population Reference Bureau ever published a report on the global demographic outlook for 1984-2034. What is the meaning of 1984? Alas, George Or-

well's fictional *Nineteen Eighty-Four*, published in 1949 and read by tens of millions in 62 languages, is now little known. Probably this is because its portrayal of a totalitarian world in constant warfare by 1984 proved quite incorrect. Few people recall that Orwell himself stated: "I do not believe that the kind of society I describe necessarily *will* arrive, but I believe (allowing, of course, for the fact that the book is a satire) that something resembling it *could* arrive."[44] However, another early 20th century visionary, the great mathematician-philosopher Albert Einstein, did warn the people of the planet: "We shall require a substantially new manner of thinking if mankind is to survive."[45]

Perhaps as a result of Einstein's warning, many people in 2034 are rediscovering two other 20th century authors whose works are now over a century old—the French philosopher Teilhard de Chardin and Lester Frank Ward, the father of American sociology. Teilhard viewed evolution as an incomplete but ongoing process, with humankind always evolving, both mentally and socially, toward a final spiritual unity, a state he called Noösphere. Ward felt that through the social sciences humankind would move toward what he called "Sociocracy" where education would be the dynamic factor leading to a new type of social order.[46] Both argued eloquently for placing the good of society above that of the individual, to the ultimate benefit of the latter. Teilhard's Noösphere and Ward's Sociocracy are now being seriously discussed among intelligentsia as answers are earnestly sought for the problems we all face as the mid-21st century nears. Will this lead to new societies on planet Earth? Capitalism as it was known in the 20th century and communism have disappeared and a new social democracy—a "Sociocracy"—may be emerging in many countries.

Back in the 1970s, some people expressed concern that the combination of rapid population growth in developing regions and below-replacement fertility in the developed capitalist countries would lead to the demise of Western capitalism. While demographically correct, the concern was misplaced. Western capitalism played a vital role in the evolution of humankind on this planet, spawning, as it did, the Industrial Revolution of the 18th, 19th, and early 20th centuries and the scientific and technological revolutions of the later 20th century. But as we move toward the mid-21st century after the tremendous changes that have transpired in the past 50 years, capitalism—or communism, for that matter—is no longer appropriate. The renewed interest in Teilhard and Ward suggests the emergence of a whole new way of life, one that will be more rational, will aim toward zero population growth worldwide as soon as possible, and toward increased international awareness and decreased national chauvinism—in a word, toward permanent peace.

Epilogue

This has been a generally optimistic scenario of the next 50 years on planet Earth. Basic to this optimistic view were two assumptions. We assume that human beings will, in their own selfish best interests, see to it that political leaders are not allowed to introduce warfare among the nations of the earth, so that we all survive; and see to it that all residents of the planet share in the benefits of developments in technology and the sciences. Humankind can solve the problems facing planet Earth *if humankind so desires*. This assumption concerning future human behavior reflects one recently put forth by author Herman Wouk:

". . . . it is not to say that humans will suddenly in 1984 begin thinking rationally about the future. That would be too much to hope for. Rather, it assumes that humans will not act irrationally and will somehow plow along, somehow find the ways to make it through."[47]

That is about as optimistic as we can get.

There is no assurance that humankind will not act irrationally; that humankind

will see to it that leaders do not force us all into international warfare; that we do not rape the planet of its precious resources; that we do not create massive pollution. There is no assurance that the enormous population growth in some parts of the world will not lead to an even more massive eruption of people across international borders looking for a better way of life. Kingsley Davis, as noted, suggested such a possibility already in 1948. In the mid-1970s, the late President Houari Boumediene of Algeria warned (or threatened?):

"No quantity of atomic bombs could stem the tide of billions . . . . who will some day leave the Southern part of the world to erupt into the relatively accessible spaces of the rich Northern Hemisphere looking for survival."[48]

This *Bulletin's* relatively hopeful scenario will not take place if humankind does not remain on vigil to assure that conditions improve for all. Population growth could continue unabated in Latin America, in Africa, in Asia. Hoards of people could leave the less developed countries and force their way into the developed countries, as fictionalized by the French novelist Jean Raspail in his book *Camp of Saints*.[49] All this could lead to further international confrontations and nuclear war. We simply cannot make such predictions. We must remain optimistic and hope, as John Stuart Mill wrote in 1857:

"If the Earth must lose that great portion of its pleasantness which it owes to things that the unlimited increase of wealth and population would extirpate from it, for the mere purpose of enabling it to support a larger, but not a happier or a better population, I sincerely hope for the sake of posterity, that they will be content to be stationary, long before necessity compels them to it."

When Mill wrote these words, the population of the planet numbered less than 1.5 billion.

More recently with the population approaching 4.5 billion, these hopeful words were uttered:

"There are real and growing dangers to our simple and most precious possessions: the air we breathe; the water we drink; and the land which sustains us. The rapid depletion of irreplaceable minerals, the erosion of topsoil, the destruction of beauty, the blight of pollution, the demand of increasing billions of people, all combine to create problems which are easy to observe and predict but difficult to resolve. If we do not act, the world of the year 2000 will be much less able to sustain life than it is now. But there is no reason for despair. Acknowledging the physical realities of our planet does not mean a dismal future of endless sacrifice. In fact, acknowledging these realities is the first step in dealing with them. We can meet the resource problems of the world—water, food, minerals, farmlands, forests, overpopulation, pollution—if we tackle them with courage and foresight."

Those are the words of U.S. President Jimmy Carter in his farewell address to the American people in January 1981. One final prediction: These words will be remembered in 2034. □

References

1. Orwell, George, *Nineteen Eighty-Four* (New York: Harcourt Brace, 1963, originally published 1949).
2. Franklin, Benjamin, "Observations Concerning the Increase of Mankind, Peopling of Countries, Etc.," in Albert H. Smyth et al. (eds.), *The Writings of Benjamin Franklin*, Vol. 3 (New York: Haskell, 1969, originally published 1907) pp. 63-73.
3. United Nations, "The Past and Future Growth of World Population—A Long View," *Population Bulletin of the United Nations*, No. 1 (New York: 1952).
4. U.S. Bureau of the Census, "Projections of the Population of the United States: 1982 to 2050 (Advance Report)," *Current Population Reports*, Series P-25, No. 922, 1982.
5. Espenshade, Thomas J., Leon F. Bouvier, and W. Brian Arthur, "Immigration and the Stable Population Model," *Demography*, Vol. 19, No. 1 (February 1982) p. 132.
6. United Nations, *Demographic Yearbook 1965* (New York: 1966) Table 30.
7. Naisbitt, John, *Megatrends: Ten New Directions Transforming Our Lives* (New York: Warner Books, 1982) p. 12.
8. Bell, Daniel, *The End of Ideology* (New York, Crowell-Collier, 1961). See also Benjamin S. Kleinberg, *American Society in the Post-Industrial Age* (New York: Merrill, 1973).
9. Richmond, Anthony, "Sociology of Migration in Industrial and Post-Industrial Societies," in J. A. Jackson (ed.), *Migration* (London: Cambridge University Press, 1969) pp. 238-281.
10. Leontief, Wassily, "Technological Advance, Economic Growth, and Income Distribution," *Population and Development Review*, Vol. 9, No. 3 (September 1983) pp. 403-411.
11. Ehrlich, Paul, *The Population Bomb* (New York: Ballantine, 1968).
12. United Nations, *Demographic Indicators of Countries: Estimates and Projections as Assessed in 1980* (New York: 1982) p. 232.
13. Gwatkin, Davidson R. and Sarah K. Brandel, "Life Expectancy and Population Growth in the Third World," *Scientific American*, Vol. 246, No. 5 (May 1982) pp. 57-66.
14. Davis, Kingsley, *Human Society* (New York: Macmillan, 1948) p. 592.
15. Tien, H. Yuan, "China: Demographic Billionaire," *Population Bulletin*, Vol. 38, No. 2 (April 1983) p. 26.
16. For an early view of this consensus, see Michael Teitelbaum, "Population and Development: Is a Consensus Possible?" *Foreign Affairs*, Vol. 52, No. 4 (July 1974) pp. 742-761.
17. "Population and the Size of the Domestic Market: A Malaysian View," *Population and Development Review*, Vol. 9, No. 2 (June 1983) pp. 389-391.
18. Friedlander, Dov and Ruth Klinov Malul, "The Aging Society and Economic Burden," *Intercom*, Vol. 11, No. 1/2 (January/February 1983) pp. 8-10.
19. Huyck, Earl and Leon F. Bouvier, "The Demography of Refugees," *Annals of the American Academy of Arts and Sciences*, No. 467 (May 1983) pp. 39-61.
20. Billington, James, "A Time of Danger, An Opening for Dialogue," *The Washington Post*, November 20, 1983, p. F8.
21. "U.S. Will Stay No. 1 Even As Superpowers Wane," in "What the Next 50 Years Will Bring," Special Supplement, *U.S. News & World Report*, May 9, 1983, pp. A34-A36.
22. See, for example, Garrett Hardin, "Nobody Ever Dies of Overpopulation," *Science*, Vol. 171, No. 3971 (February 12, 1971) pp. 527-529; Wayne H. Davis, "More or Less People: Thoughts on Feeding the Hungry," *New Republic*, June 20, 1970, pp. 19-21; and Lincoln and Alice Day, *Too Many Americans* (New York: Houghton-Mifflin, 1964).
23. Revelle, Roger, "The Resources Available for Agriculture," *Scientific American*, Vol. 235, No. 3 (September 1976) p. 177.
24. Gilland, Bernard, "Population and Food Supply," *Population and Development Review*, Vol. 9, No. 2 (June 1983) pp. 203-212. See also, Paul Harrison, "Land and People: The Growing Pressure," *Earthwatch*, No. 13, 1983, based in part on Food and Agriculture Organization, *Land Resources for Populations of the Future* (Rome: 1983).
25. Quoted in "Rumors of Earth's Death Are Greatly Exaggerated," in Special Supplement, *U.S. News & World Report*, May 9, 1983, p. A12.
26. O'Neill, William, *2081: A Hopeful View of the Human Future* (New York: Simon Schuster, 1981).
27. Cited in "Machines That Think," *U.S. News & World Report*, December 5, 1983, p. 59.
28. Quoted in "Medicine Dares to Dream of the Impossible," in Special Supplement, *U.S. News &*

World Report, May 9, 1983, p. A6.
29. Bronwell, Arthur, "Democracy in the Twenty-First Century," in Andrew A. Spekke (ed.), *The Next 25 Years: Crisis & Opportunity* (Washington, DC: World Future Society, 1975) p. 141.
30. Drozdiak, William, "West German Birthrate Dropping: Trend Raises Concerns About Economic Impact," *The Washington Post*, January 10, 1984, p. A10. See also, Carl Haub, "Beyond the Demographic Transition: The Case of West Germany," *Intercom*, Vol. 10, No. 5-6 (May-June 1982) pp. 8-10.
31. United Nations, *Demographic Indicators*, p. 58.
32. Ayres, Robert and Steve Miller, "Industrial Robots on the Line," *Technology Review*, May/June 1982, p. 42.
33. Espenshade, Thomas L. and Leon F. Bouvier, "Fertility, Immigration, and Isopops," *Intercom*, Vol. 10, No. 3 (March 1982) pp. 8-10.
34. Employment and Immigration Canada, *Background Paper on Future Immigration Levels* (Ottawa: 1983).
35. Crisostomo, Rosemarie, *The Demographic Dilemma of the Soviet Union*, International Research Document No. 10 (Washington, DC: Bureau of the Census, 1983). See also, Marvin Stone, "Communism's Astonishing Failure," *U.S. News & World Report*, December 19, 1983, p. 82.
36. Feshbach, Murray, "The Soviet Union: Population Trends and Dilemmas," *Population Bulletin*, Vol. 37, No. 3 (August 1982) p. 21.
37. Quoted in Martin Rosenberg, "Competition is Good: Cooperation is Better," *USA Today*, November 7, 1983, p. 11A.
38. Thompson, Warren S., "Recent Trends in World Population," *American Journal of Sociology*, Vol. 34, No. 6 (May 1929) pp. 959-975; Frank W. Notestein et al., *The Future Population of Europe and the Soviet Union* (Geneva: League of Nations, 1944).
39. For a recent critique, see Dennis Hodgson, "Demography as Social Science and Policy Science," *Population and Development Review*, Vol. 9, No. 1 (March 1983) pp. 1-34.
40. Downey, Thomas, "Do We Know What We're Doing with Military Force?", *The Washington Post*, November 6, 1983, p. D4.
41. Ayres and Miller, "Industrial Robots on the Line," p. 35.
42. Schumacher, E. P., *Small is Beautiful: Economics as if People Mattered* (New York: Harper & Row, 1975).
43. United Nations Secretariat, "Long-Range Global Population Projections as Assessed in 1980," *Population Bulletin of the United Nations*, No. 14 (New York: 1983) pp. 17-30. In the medium variant of these latest U.N. long-range projections, the earth's population is projected to become stationary after 2095 at 10.2 billion persons.
44. Quoted in Paul Gray, "That Year is Almost Here," *Time*, November 28, 1983, p. 56.
45. Cited in Michael Kernan, "Growing up with the Bomb," *The Washington Post*, November 20, 1983, p. L1.
46. Teilhard de Chardin, *The Phenomenon of Man* (New York: Harper & Row, 1959, English translation of French original published 1940); and Lester Frank Ward, *Applied Sociology: A Treatise on the Conscious Improvement of Society by Society* (New York: Arno, 1974, reprint of original published 1906).
47. Wouk, Herman, "Must Wars Occur?" *Parade Magazine, The Washington Post*, February 6, 1983.
48. Quoted in Bob Reiss, "The Melting Pot," *Potomac Magazine, The Washington Post*, July 17, 1977.
49. Raspail, Jean, *Camp of Saints*, English translation (Arlington, VA: Institute for Western Values, 1982).

Selected Bibliography

Leon Bouvier, the author of this *Population Bulletin*, suggests the following for those interested in reading more on past and current views of the world's future.

Anderson, Charles, H., *The Sociology of Survival: Social Problems of Growth* (Homewood, IL: Dorsey Press, 1976).

Bell, Daniel, *The Coming of the Post-Industrial Society: A Venture in Social Forecasting* (New York: Basic Books, 1973).

Boulding, Kenneth E., *The Meaning of the Twentieth Century: The Great Transition* (New York: Harper Colophon, 1965).

Brown, Harrison, *The Challenge of Man's Future* (New York: Viking, 1954).

Brown, Lester R., *Building a Sustainable Society*, A Worldwatch Institute Book (New York: Norton, 1981).

Commoner, Barry, *The Closing Circle: Nature, Man and Technology* (New York: Knopf, 1972).

Davis, Kingsley, *Human Society* (New York: Macmillan, 1948).

Ehrlich, Paul, *The Population Bomb* (New York: Ballantine, 1968).

Ellul, Jacques, *The Technological Society* (New York: Vintage Books, 1964).

Ferkiss, Victor, *The Future of Technological Civilization* (New York: Braziller, 1974).

Heilbronner, Robert L., *An Inquiry into the Human Prospect* (New York: Norton, 1975).

Kleinberg, Benjamin S., *American Society in the Post-Industrial Age* (New York: Merrill, 1973).

Lappe, Frances M. and Joseph Collins, *Food First: Beyond the Myth of Scarcity* (Boston: Houghton-Mifflin, 1977).

Leontief, Wassily et al., *The Future of the World Economy: A United Nations Study* (New York: Oxford, 1977).

Meadows, Donnella et al., *The Limits to Growth: A Report for the Club of Rome's Project on the Predicament of Mankind* (New York: Universe, 1972).

Naisbitt, John, *Megatrends: Ten New Directions Transforming Our Lives* (New York: Warner Books, 1982).

Orwell, George, *Nineteen Eighty-Four* (New York: Harcourt Brace, 1963 edition).

Schnaiberg, Allan, *The Environment: From Surplus to Scarcity* (New York: Oxford, 1980).

Schumacher, E. P., *Small is Beautiful: Economics as if People Mattered* (New York: Harper & Row, 1975).

Teilhard de Chardin, *The Phenomenon of Man*, English translation (New York: Harper & Row, 1959).

U.S. News & World Report, "What the Next 50 Years Will Bring," Special Supplement, May 9, 1983.

Recent Population Bulletins and Bulletin Slides

Population Bulletin prices, *prepaid*, are:
Single Copy—$4.00
Bulk copies:

2-10	$3.00 each
11-50	$2.50 each
51 or more	$2.00 each

Sets of 35 mm colored slides for figures and tables appearing in each *Bulletin* are available at the **additional** prices shown in parentheses.

Note: *Inside the United States*, add $1.00 for handling. *Outside the United States*, add 25 percent to the cost of Bulletins and slides ordered to cover postage and handling.

Volume 35 (1980-81)

No. 1 *America's Baby Boom Generation: The Fateful Bulge*, by Leon F. Bouvier (9 slides, $4.50)

No. 2 *Sweden Faces Zero Population Growth*, by Murray Gendell (20 slides, including frontispiece map, $10.00)

No. 3 *Kenya's Record Population Growth: A Dilemma of Development*, by Frank L. Mott and Susan H. Mott (17 slides, $8.50)

No. 4 *America's Elderly in the 1980s*, by Beth J. Soldo (18 slides, $9.00)

No. 5 *Population Growth and Poverty in the Developing World*, by Nancy Birdsall (13 slides, $6.50)

No. 6 *Catholic Perspectives on Population Issues II*, by Francis X. Murphy, C.SS.R. (5 slides, $2.50)

Volume 36 (1981-82)

No. 1 *Cuba: The Demography of Revolution*, by Sergio Diaz-Briquets and Lisandro Perez (14 slides, including frontispiece map, $7.00)

No. 2 *U.S. Women at Work*, by Linda J. Waite (13 slides, $6.50)

No. 3 *World Food Resources and Population: The Narrowing Margin*, by Lester R. Brown (16 slides, $8.00)

No. 4 *India's Population: Second and Growing*, by Pravin Visaria and Leela Visaria (19 slides, including map, $9.50)

No. 5 *The Changing U.S. Farmland Scene*, by Michael Brewer (12 slides, $6.00)

No. 6 *Eastern Europe: Pronatalist Policies and Private Behavior*, by Henry P. David (16 slides, including map, $8.00)

Volume 37 (1982)

No. 1 *The World Fertility Survey: Charting Global Childbearing*, by Robert Lightbourne Jr. and Susheela Singh, with Cynthia P. Green (21 slides, including map, $10.50)

No. 2 *U.S. Population: Where We Are; Where We're Going*, by Population Reference Bureau staff and guest experts (27 slides, $13.50)

No. 3 *The Soviet Union: Population Trends and Dilemmas*, by Murray Feshbach (22 slides, including map, $11.00)

No. 4 *Black America in the 1980s*, by John Reid (20 slides, $10.00)

Volume 38 (1983)

No. 1 *Third World Family Planning Programs: Measuring the Costs*, by Nancy Yinger, Richard Osborn, David Salkever, and Ismail Sirageldin (13 slides, $6.50)

No. 2 *China: Demographic Billionaire*, by H. Yuan Tien (17 slides, including map, $8.50)

No. 3 *U.S. Hispanics: Changing the Face of America*, by Cary Davis, Carl Haub, and JoAnne Willette (21 slides, including frontispiece map, $10.50)

No. 4 *The Changing American Family*, by Arland Thornton and Deborah Freedman (12 slides, $6.00)

Volume 39 (1984)

No. 1 *Planet Earth 1984-2034: A Demographic Vision*, by Leon F. Bouvier (9 slides, $4.50)

Send orders with checks to: Population Reference Bureau, Inc.
Circulation Department
P.O. Box 35012
Washington, D.C. 20013

Population Reference Bureau, Inc.

The PRB gathers, interprets, and disseminates information on the facts and implications of national and world population trends. Founded in 1929, it is a private, nonprofit educational organization that is supported by grants and contracts, individual and corporate contributions, memberships, and sales of publications. It consults with other groups in the United States and abroad, operates information and library services, and issues the publications described on the outside back cover. The PRB also assists the development of population education through formal and nonformal programs.

Officers

*Mildred Marcy, *Chair of the Board*
*Robert P. Worrall, *President*
*Jessma O. Blockwick, *Secretary of the Board*
*Bert T. Edwards, *Treasurer of the Board*

Trustees

Jodie T. Allen
Brent Ashabranner
John C. Beyer
Norman E. Borlaug
Wallace Bowman
Michael F. Brewer
John H. Bryant
Marriner C. Eccles, Jr.
Melvyn J. Estrin
Joseph L. Fisher
Frederick G. Harmon
Jonathan Hawley
*Robert Jordan
*Thomas W. Merrick
Douglas T. Parsons
Martha Phillips
*Raymond H. Potvin
Jack Rosenthal
Jonas Edward Salk
Bennetta B. Washington

Michael P. Bentzen, *General Counsel*
Conrad Taeuber, *Chairman Emeritus and Demographic Consultant*

Advisory Committee

Samuel Baum
Calvin L. Beale
Donald J. Bogue
Lester R. Brown
Philander P. Claxton, Jr.
Caroline S. Cochran
Mercedes B. Concepcion
Douglas Ensminger
Philip M. Hauser
Jack K. Henes
Carl A. Huether
Jose Ruben Jara
Sam Keeny
Richard K. Manoff
M. A. Sattar
Benjamin Viel
Sloan R. Wayland

*Members of the Executive Committee of the Board of Trustees

Founded in 1929, the Population Reference Bureau is now in its second half century of "telling the world about population." PRB members regularly receive the most vital, up-to-date population information available from the authorities who write PRB's four annual POPULATION BULLETINS; from the lively coverage of the latest news and trends in the monthly news magazine POPULATION TODAY; and from the annually updated WORLD POPULATION DATA SHEET and UNITED STATES POPULATION DATA SHEET wall charts. Educator and library members also receive the population education newsletter INTERCHANGE, four times during the school year, accompanied twice a year by ready-to-use classroom materials.

PRB also publishes the POPULATION TRENDS AND PUBLIC POLICY series, POPULATION BULLETIN POLICY SUPPLEMENTS, four-page EXECUTIVE SUMMARIES outlining the policy implications of current U.S. demographic trends, and special publications such as the POPULATION HANDBOOK, WORLD'S CHILDREN DATA SHEET, and INTERCOM EN ESPAÑOL. Write for a listing of publications in print.

For still more information, PRB's Library and Information Service responds to population-related questions by mail, telephone, and in-person visit. PRB's Demographic Information Services Center (DISC) offers personalized, in-depth data and analyses for individual clients seeking professional interpretation of population trends.

Members of the Population Reference Bureau support an organization that is dedicated to the objective analysis and reporting of one of the world's most compelling concerns.

Population Reference Bureau, Inc.
2213 M Street N.W.
Washington, D.C. 20037
(202) 785-4664

Abstract—In recognition of 1984 as the year of both Orwell's famous futuristic novel and the International Population Conference following up the 1974 World Population Conference, this *Bulletin* examines the current state of world population and presents the author's speculations on what it might be 50 years from now. World population, now close to 4.8 billion and growing at 1.8 percent a year, is being shaped by three demographic phenomena: prolonged below-replacement fertility in developed nations, perhaps partly in response to the reduced need for workers in the emerging "information" era; rapid growth despite falling fertility in developing nations, due to earlier rapid mortality decline; and rapid urbanization in developing nations and unprecedented migration from poor to better-off nations. The author's assumptions for non-demographic factors related to population change in the next 50 years are: no world war, nuclear or otherwise; global resource adequacy; rapid scientific and technological progress, shared equitably; and the demise of capitalism and communism and greatly increased economic aid from advanced to less advanced nations. For 2034 he envisages nations divided into: (1) service/information societies (4 percent of global population) where immigration balances low fertility to prevent population decline; (2) industrialized nations (38 percent of the total), with fertility close to or at replacement level and growth slowing; (3) developing nations (43 percent), in sight of replacement-level fertility, and (4) least developed nations, with still critical demographic problems but only 15 percent of world population. He sees total population at 8.03 billion, but growth is down to 0.8 percent a year and global zero growth is possible in another 50 years. He warns that his relatively optimistic scenario for 2034 will only be possible if humankind acts to see that the stated non-demographic assumptions are borne out.

Editor: Jean van der Tak Graphics: George Hager

The *Population Bulletin* is published in four issues per volume and is distributed along with other publications listed on the back cover to members of the Population Reference Bureau. If you would like to order additional copies of this *Bulletin* or join the PRB if you are not already a member, write the Circulation Department, Population Reference Bureau, Inc., 2213 M Street, N.W., Washington, D.C. 20037. Annual membership rates *inside the United States* are: individuals, $30; college teachers, $20; school teachers, $10; students, $10; school, university, and public libraries, $40; corporations or institutions, $200. *For all other countries*, the rates are: individuals, $37.50; college teachers, $25; school teachers, $12.50; students, $12.50; school, university, and public libraries, $50.00; corporations or institutions, $250. Prices of the *Population Bulletin, prepaid*, are: $4.00 per single copy; bulk copies: 2-10, $3.00 each; 11-50, $2.50 each; 51 or more, $2.00 each. *Inside the United States*, add $1.00 for handling. *Outside the United States*, add 25 percent to the cost of *Bulletins* ordered to cover postage and handling.

For information on other recent *Bulletins* and *Bulletin Slides*, see page 40.

The suggested citation, if you quote from this publication is: Leon F. Bouvier, "Planet Earth 1984-2034: A Demographic Vision," *Population Bulletin*, Vol. 39, No. 1 (Population Reference Bureau, Inc.: Washington, D.C., 1984). The figures and tables from the *Bulletin* may be freely reproduced provided credit is given to the Population Reference Bureau and a copy of the publication in which they appear is forwarded to the PRB.

The *Population Bulletin* is indexed in *GEO Abstracts, Population Index, Social Sciences Index*, and *Social Sciences Citation Index*. It is included in the coverage of *Current Contents Social and Behavioral Sciences*, Biosciences Information Service of Biological Abstracts, and the CICRED UNFPA *Review of Population Reviews*, and is available on microfilm from Xerox University Microfilms, 300 North Zeeb, Ann Arbor, MI 48106. Selected *Bulletins* are also included in the coverage of and available in microfiche through ERIC Systems.